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PRELIMINARY FOREST HABITAT TYPES OF EASTERN IDAHO AND WESTERN WYOMING

by

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I. INTRODUCTION

The habitat type approach of R. and J. Daubenmire (1968) to classifying forest ecosystems has proven useful for delineating forest environments and its application has expanded rapidly over the last decade (Layser, 1974). Similar classifications have now been developed for about 20 areas in the western United States (Pfister, 1976).

In the eastern Idaho-western Wyoming area, two studies provide partial coverage. Reed (1969) defined five rather broad h.t.s in the Wind River Range of Wyoming. Cooper (1975) covered a much broader area (Teton division of Bridger-Teton NF, most of the Targhee NF, Yellowstone NP and Teton NP) and related it to concurrent studies in Montana (Pfister and others, 1977) and central Idaho (Steele and others, 1975). However, Cooper's (1975) thesis did not include management implications and a large area of eastern Idaho-western Wyoming still needed a classification.

In 1976, two field crews (Steele and Ondov) sampled the area not covered in previous studies as well as some fill-in sampling in areas previously covered. Data from: (1) this sampling, (2) Cooper's (1975) thesis, (3) Reed's (1969) thesis, (4) Henderson and others (1976) stands in Idaho, and (5) selected stands in central Idaho (Steele and others, 1975) were combined for analysis of the h.t.s in this report.

Since Cooper's data were a major input, he was asked to help evaluate and modify this combined classification as a co-author. No additional sampling was done in the Teton and Yellowstone National Parks to supplement the original sampling of Cooper. However, this combined classification also covers those areas.

A. OBJECTIVES AND SCOPE

The objectives of this study are:

1. To develop a habitat type classification for the forest lands in eastern Idaho and western Wyoming.

2. To coordinate and unite this classification with existing classification wherever possible; this effort will also require considerable refinement beyond the scope of this preliminary classification.

3. To produce a first approximation of general management implications for each habitat type.

This preliminary classification is only a step toward completing these objectives and will require field testing and feedback from users before it can be finalized.

The area studied includes the Bridger-Teton, Caribou, and Targhee National Forests (Fig. 1) and adjacent forest land regardless of ownership. Areas dominated by species of Acer, Populus, or Juniperus were not included.

B. ACKNOWLEDGEMENTS

Major financial support for this study was provided by the Intermountain Region of the U.S. Forest Service and the Bridger-Teton National Forest through a memorandum of understanding with the Intermountain Forest and Range Experiment Station.

Several people have assisted this effort in various ways. Dr. Edward F. Schlatterer (Intermountain Region) provided data taken during reconnaissance of the Greys River and Hoback River drainages. Cecil Brown (Idaho State Fish and Game) provided considerable data from concurrent studies of plant communities critical to wildlife. Mert Lombard (Bureau of Land Management) gave us data from timber inventory plots within the study area. Dr. Jan A. Henderson (Utah State University) provided data from a concurrent habitat type classification effort in Northwestern Utah and adjacent Idaho. Dr. Don G. Despain (National Park Service) provided locations of Cooper's (1975) sample plots in Yellowstone National Park, and Dr. Al Calbraith and Al Collotzi (Bridger-Teton National Forest) coordinated logistical support during the field season. Dr. Stephen F. Arno (Intermountain Station) reviewed the manuscript.

Specialists in other fields provided supplementary information. Dr. Marcia Wicklow (Boise State University) identified the lichens collected in our sample plots. Likewise, Alma Steele identified numerous mosses and Dr. Won Shic Hong (College of Great Falls) named the liverworts.

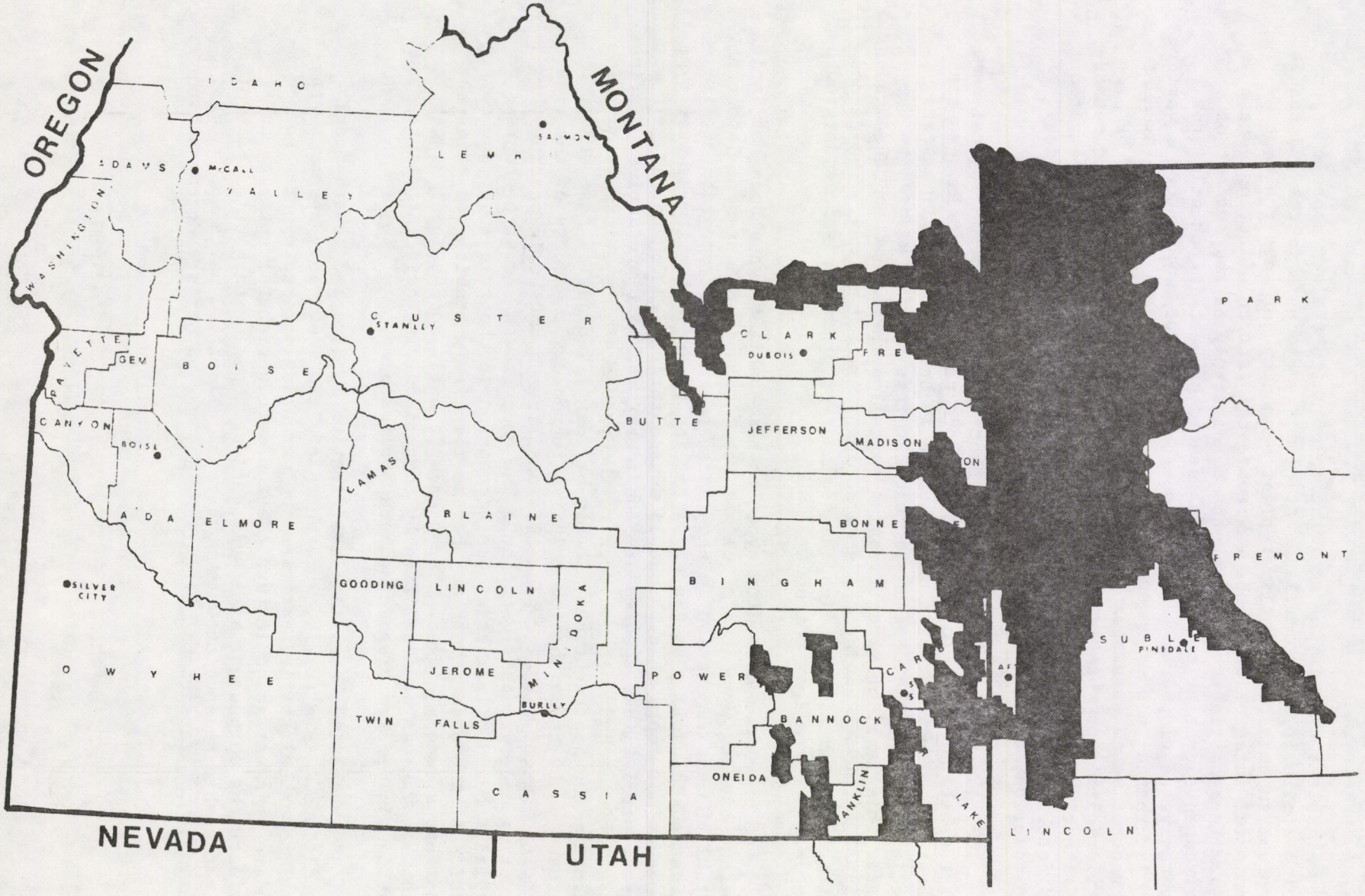


Fig. 1. The portion of eastern Idaho and western Wyoming (darkened area) covered in this study.

II. THE HABITAT TYPE CONCEPT

A habitat type is the aggregation of units of land capable of producing similar plant communities at climax. Since it is the end result of plant succession, the climax plant community reflects the most meaningful integration of the environmental factors affecting vegetation. Each habitat type represents a relatively narrow segment of environmental variation that is delineated by certain potential for vegetative development. Although one habitat type may support a variety of disturbance-induced or seral plant communities the ultimate product of vegetative succession anywhere within one habitat type will be similar climax communities. Thus, the habitat type system is a method of site classification that uses the plant community as an integrated indicator of environmental factors. These factors affect species reproduction, competition, and plant community development.

The climax community type, or association, provides a logical name for the habitat type, for example Pseudotsuga menziesii/Calamagrostis rubescens. The first part of this name is based on the climax tree species, usually the most shade tolerant tree species adapted to the site. This level of stratification is called the series and encompasses all habitat types having the same dominant tree at climax. The second part of the name is based on the dominant or characteristic undergrowth species in the climax community.

Use of climax community types to name habitat types does not imply that we have an abundance of climax vegetation in the present landscape. Actually, most vegetation in the landscape reflects some form of disturbance and various stages of succession towards climax. Habitat type names do not imply that we should manage for climax vegetation. In most cases, seral timber species are considered the most productive. Furthermore, this method does not require the presence of a climax stand to identify the habitat type. It can be identified during most stages of succession by comparing the relative reproductive success of the tree species present with known successional trends and by inspecting the existing undergrowth vegetation. The undergrowth seems to progress more rapidly toward climax than does succession in the tree layer and composition of the undergrowth may become relatively stable soon after the coniferous canopy closes. For stands in early successional stages, the habitat type can be identified by comparison with adjacent mature stands having similar topographic and edaphic features.

By necessity, natural classification is directed toward modal conditions. As a result, some units of land inevitably appear peripheral to the classified entities, but creating more categories to accommodate this variation in turn creates more peripheral entities and defeats the purpose of a classification. Thus we have tried to achieve a manageable balance between numbers of classified units and natural variation. Transitional situations may reduce utility of the habitat

type classification somewhat but can be recognized as intergrades between the designated types and managed accordingly. Also, transitional situations or ecotones in one area often occur as major habitat types or phases elsewhere, thus leaving the final intensity of stratification to decision of the fieldworker.

Transitional areas or ecotones between habitat types can be interpreted as being either broad or narrow. If ecotones are broad, the habitat types have less variation, that is, stands within a habitat type tend to be more modal. If ecotones are interpreted as being narrow, the types include more diversity but more of the land is definable to habitat type and less is in an impractical "ecotone" or "hybrid" category. We interpreted the ecotones as narrowly as possible by using canopy coverage classes--thus the types encompass more variation with further refinement provided at the phase level.

The utility of habitat types in forest management is that they provide a permanent and ecologically-based system of land stratification in terms of vegetation potential (Daubenmire, 1976). Habitat types also provide a vegetational classification system for near climax forest communities. Each habitat type encompasses a certain amount of environmental variation but the variation within a particular habitat type generally should be less than between types. Thus plant succession should be predictable for each habitat type and a similar response to management treatments can be expected on most units of land within the same type.

In discussing the relationship of a habitat type to certain environmental features, we have followed the general polyclimax concept of Tansley (1935). Thus, a climatic climax is found on deep loamy soils of gently undulating relief; an edaphic climax develops on "abnormal" soils; and a topographic climax reflects compensating effects of aspect, or different microclimatic effect. The topoedaphic climax is a convenient way to designate deviation from a climatic climax due to combined effects of edaphic and topographic features. Some habitat types are exclusively one type of climax, but most can be found in any category, depending on the interaction of specific environmental features. In the mountainous terrain of Idaho, climatic climax sites are generally scarce. Thus most stands observed are influenced strongly by topographic features such as aspect and slope or by edaphic features such as loess or volcanic ash deposits.

III. METHODS

A. FIELD METHODS

Mature stands were sampled along elevational road transects selected to reflect the full range of environmental conditions in the study area. Usually the team leader made note of potential sampling sites as he reconnoitered the transect. Brief stops were made to inspect undergrowth composition; the overstory and general undergrowth patterns were observed en route. On the return trip, the sites which seemed to best represent the kinds of plant associations for that area were sampled.

In each stand, a 375 m2 (0.092 acres) circular plot was established and referenced for possible revisitation during the study. In each plot trees over 4! feet tall were tallied by 2-inch d.b.h. classes according to species. Trees between 6 inches and 4! feet in height were recorded by species in a 50 m2 circular plot. Amounts of all vascular plant species were estimated by seven canopy-coverage classes (+ = present in stand but not in plot, T = 0-1% coverage, 1 = 1-5%, 2 = 5-25%, 3 = 25-50%, 4 = 50-75%, 5 = 75-95%, 6 = 95-100%). For maximum efficiency, these coverages were estimated within the entire 375 m2 plot instead of the usual series of small quadrats (Daubenmire, 1959). With practice and coordination among the samplers (including practice layouts within the plot representing areas of 1%, 5% and 25%), it is possible to visualize and estimate coverage of all the plants by this one method. Accuracy may be somewhat less than where coverages are estimated in small quadrats but the number of stands sampled in a day can be at least doubled, thus providing better sample coverage of the region. These coverage-class estimates can be used directly in association tables or ordinations.

All unidentified plants on each plot were collected and preserved for later identification or verification. Known plants were also collected for voucher specimens.

A relatively free-growing tree of each species present was measured for height, age, and d.b.h. in order to estimate site potential by species. Suitable site trees for each species were not always available, especially in the denser stands.

Thicknesses of litter, fermentation, and humus layers were measured at three locations in the plot. Samples of the upper 20 centimeters (about 8 inches) of mineral soil were collected for laboratory analysis along with samples of the parent material. Observations were also made on fire history, insect and disease occurrence, animal use, and environmental position of the stand in relation to adjoining stands. This latter observation proved very valuable during analyses.

B. OFFICE METHODS

Development of the classification required a series of approximations and tests. The plot data were first compared to the existing classifications for Montana (Pfister and others, 1977), northwestern Wyoming (Cooper, 1975), Northwestern Utah and adjacent Idaho (Henderson and others, 1976), the Wind River Mountains (Reed, 1969) and central Idaho (Steele and others, 1975). Where conflicts arose between these classifications, the most appropriate classified entity was chosen and occasionally modified to accommodate actual conditions over the entire area. Plot data were selected from the above studies to supplement our information. In many cases these data helped to fill gaps in our own reconnaissance coverage and provided additional information on peripheral areas.

Association tables (Mueller-Dombois and Ellensberg, 1976) were constructed from computer printouts. These tables incorporated all the data available for the area. From these groupings, validity of previously defined types were ascertained and certain species were recognized as constituting new climax undergrowths. The new undergrowths, when coupled with appropriate climax tree series, delineated a few new habitat types and phases.

The characteristic vegetational parameters for these types and phases were identified and briefly described. The plots were then inspected for similarities in geographic distribution, elevation, aspect, topographic position, soils, etc. to insure that realistic environmental patterns exist for each habitat type and phase.

A key to the habitat types was constructed using the vegetational parameters. This key was then applied to all plot data on hand. Some revisions in the type descriptions and key were made to accommodate the actual stand data. Constancy and average cover values were calculated for the important indicator plants following these revisions. The final delineations were compared with the existing classifications in adjacent areas (Pfister and others, 1977; Steele and others, 1975; Henderson and others, 1976; Pfister, 1972; Hoffman and Alexander, 1975; Wirsing and Alexander, 1976) to insure an adequate merger of the entire classification system.

Terminology for the types was adjusted to compare as directly as possible with the existing classification in adjacent areas, and to express the interrelationships of our types as clearly as possible. The phase was used as a classification unit to subdivide habitat types where appropriate. In some cases a phase represents a broad transition (ecotone) between two adjacent habitat types. In other cases, a phase represents a difference of vegetation dominance in a third layer, whereas the habitat type is defined by dominants or indicator species in two layers (for example Abla/Vasc h.t. Caru phase).

A description was prepared for each defined habitat type including a generalized discussion of physical environmental features, geographical distribution, key vegetational features, descriptions of phases and basis for their separation, and general implications for management.

A dot map showing the known locations of each habitat type was prepared using all available data (see acknowledgements). As these distribution maps become more complete, the affinities of a habitat type to certain climatic or geologic influences become more evident and add to a better understanding of each classified unit.

The types presented in this report are preliminary. Your assistance can greatly aid completion of this project and improve the accuracy of the final system. Any stands not fitting in this classification framework need to be considered in the final classification. For any stands that fit poorly into this classification, please complete the habitat type checklist, including stand location, and send this information to us. We will try to pinpoint the problem in classifying the particular stand, and will, if necessary, visit the problem area to include it in our final analyses. The users of this system are, in effect, testing its applicability and any feedback, positive or negative, will be appreciated.

C. TAXONOMIC CONSIDERATIONS

Most plants were identifiable to species, but a few non-flowering specimens remain unidentified. Voucher collections were made during the course of stand sampling and are deposited in the Herbarium of the Intermountain Forest and Range Experiment Station at Boise. Taxonomic nomenclature follows Hitchcock and Cronquist (1973). Species not covered in this treatment follow Harrington (1954).

Stickney (1972) found that essentially all of the Vaccinium globulare-V. membranaceum material collected in Montana would best be labeled V. globulare. Using shape of flowers and leaves as the diagnostic features, it appears that most flowering material observed in central Idaho also best conforms to V. globulare (Steele and others, 1975). Only a small amount of flowering material was found in the study area, but this also fits V. globulare and for the sake of uniformity this epithet was used for the entire complex.

Special attention is needed to distinguish Pinus albicaulis from P. flexilis. Cones of P. albicaulis are purplish and disintegrate on the tree leaving mainly detached scales on the ground. Cones of P. flexilis turn from green to brown and remain intact on the ground for a few years. P. flexilis occurs throughout the study area at lower elevations of the forest zone and extends upward on the warmer exposed aspects. P. albicaulis is more common in the northern half of the study area and

becomes scarce on the Caribou National Forest. It occurs mainly at the upper elevations of the forest zone, extending downward on the cooler aspects. Occasionally, the two species merge such as in the Wind River Mountains but even here the bulk of the population is separated by the site conditions described.

Symphoricarpos albus and S. oreophilus are sometimes confused unless certain features are noted. One or two-year-old stems of S. albus have a small but definite hole running through the pith and the shrub is rhizomatous creating uniform patches. Stems of S. oreophilus have a solid pith and the shrub is non-rhizomatous causing it to grow as individual clumps. In the study areas S. albus is fairly restricted to terraces, moist areas, and fine textured soils, whereas S. oreophilus is widespread and often abundant on ridges and dry rocky sites.

Distinguishing among Thalictrum occidentale, T. fendleri and sometimes T. venulosum is practically impossible without mature fruits. Most Thalictrum in the study area is T. fendleri with T. occidentale occurring on mesic sites north of the Hoback River-Palisades Reservoir area. Some Thalictrum appearing on dry sites in the Beaverhead and Lemhi Ranges is thought to be T. venulosum.

Osmorhiza chilensis and O. depauperate are also difficult to separate without fruits. In this case, however, the two species often occur on the same site and within the study area their ecologies appear similar enough to be grouped as one.

Separating Arnica cordifolia from A. latifolia can be confusing and flowering material is needed for positive identification. The leaves of flowering stems of A. latifolia are largest toward the middle whereas those of A. cordifolia are largest near the base.

IV. THE HABITAT TYPE CLASSIFICATION

A total of 35 forest habitat types are defined for the study area and 10 incidental types are briefly mentioned. This may seem like a large number but the environmental diversity encountered warrants recognition of many types. The total classification is listed in Table 1 for easy reference. The term "habitat type" is mentioned so often that the abbreviation "h.t." ("h.t.s" plural) is used to save space. Frequent use of h.t. names in the text also created a need for abbreviations. We have used the first two letters of the genus and the first two letters of the species of the two plants involved as the taxonomic abbrevation of each h.t. Scientific names of h.t.s and their abbreviations are listed in Table 1. Scientific, abbreviated, and common names of indicator species are listed in the h.t. field form, Appendix D. Common names are not used in the text because variations in their local usage may cause confusion.

The study area encompasses physiographic transitions between the Northern Rocky, Central Rocky, and Great Basin Provinces (Fenneman, 1931). It also includes transitions between floristic units of these areas (Cronquist and others, 1972). The result is a relatively complex aggregation of habitat types and phases, the affinities of which are partially revealed through their total distribution as shown on the maps for each habitat type.

The following order is used in presenting the classification:

(a) Key to the Series The first step in correct identification of the h.t. is identifying the potential climax tree species.

(b) Series Description Many of the characteristics of a group of h.t.s are summarized at the series level, rather than repeating general similarities in vegetation and habitat characteristics in the h.t. descriptions.

(c) Key to the Habitat Types in a Series This key is based primarily on characteristics of the undergrowth vegetation and identifies all h.t.s. Criteria for phases are outlined below the appropriate h.t.s.

(d) Habitat Type Description This covers characteristics of the h.t., its geographic range, topographic position, vegetation, phases, and general management implications. Incidental h.t.s are those which may occur in the study area but are not extensive and are more common elsewhere. These have only brief descriptions and are excluded from the tables and appendix.

Table 1. List of habitat types and phases

Habitat types and phases	ADP Code	Abbreviation	Page
A. Pinus flexilis Series	000		16
1. Pinus flexilis/Cerocarpus ledifolius h.t.	060	Pifl/Cele h.t.	17
2. Pinus flexilis/Hesperochloa kingii h.t.	080	Pifl/Heki h.t.	19
B. Pseudotsuga menziesii Series	200		20
3. Pseudotsuga menziesii/Physocarpus malvaceus h.t.	260	Psme/Phma h.t.	25
4. Pseudotsuga menziesii/Acer glabrum h.t.	390	Psme/Acgl h.t.	27
a. Pachistima myrsinites phase	391	Pamy phase	27
b. Symphoricarpos oreophilus phase	392	Syor phase	27
5. Pseudotsuga menziesii/Vaccinium globulare h.t.		Psme/Vagl h.t.	29
6. Pseudotsuga menziesii/Symphoricarpos albus h.t.	310	Psme/Syal h.t.	31
7. Pseudotsuga menziesii/Spiraea betulifolia h.t.	340	Psme/Spbe h.t.	33
a. Calamagrostis rubescens phase	343	Caru phase	33
b. Spiraea betulifolia phase	341	Spbe phase	33
8. Pseudotsuga menziesii/Osmorhiza chilensis h.t.	375	Psme/Osch h.t.	35
9. Pseudotsuga menziesii/Calamagrostis rubescens h.t.	320	Psme/Caru h.t.	37
a. Pachistima myrsinites phase	325	Pamy phase	37
b. Calamagrostis rubescens phase	323	Caru phase	37
10. Pseudotsuga menziesii/Juniperus communis h.t.	360	Psme/Juco h.t.	39
11. Pseudotsuga menziesii/Cercocarpus ledifolius h.t.	385	Psme/Cele h.t.	41
12. Pseudotsuga menziesii/Berberis repens h.t.	390	Psme/Bere h.t.	43
13. Pseudotsuga menziesii/Arnica cordifolia h.t.	370	Psme/Arco h.t.	45
a. Arnica cordifolia phase	371	Arco phase	45
b. Astragalus miser phase	372	Asmi phase	45
14. Pseudotsuga menziesii/Symphoricarpos oreophilus h.t.	380	Psme/Syor h.t.	47
C. Picea engelmannii Series	400		49
15. Picea engelmannii/Equisetum arvensis h.t.	410	Pien/Eqar h.t.	53
16. Picea engelmannii/Galium triblorum h.t.	440	Pien/Gatr h.t.	55
17. Picea engelmannii/Vaccinium scoparium h.t.	490	Pien/Vasc h.t.	57
18. Picea engelmannii/Hypnum revolutum h.t.	493	Pien/Hyre h.t.	59
19. Picea engelmannii/Ribes montigenum h.t.	497	Pien/Rimo h.t.	61
D. Abies lasiocarpa Series	600		62
20. Abies lasiocarpa/Actaea rubra h.t.	601	Abla/Acru h.t.	71
21. Abies lasiocarpa/Physocarpus malvaceus h.t.	603	Abla/Phma h.t.	73
22. Abies lasiocarpa/Acer glabrum h.t.	645	Abla/Acgl h.t.	75
23. Abies lasiocarpa/Linnaea borealis h.t.	660	Abla/Libo h.t.	77
a. Vaccinium scoparium phase	663	Vasc phase	77
b. Linnaea borealis phase	661	Libo phase	77
24. Abies lasiocarpa/Vaccinium globulare h.t.	720	Abla/Vagl h.t.	79
a. Vaccinium scoparium phase	721	Vasc phase	79
b. Pachistima myrsinites phase	722	Pamy phase	79
25. Abies lasiocarpa/Symphoricarpos albus h.t.	607	Abla/Syal h.t.	81
26. Abies lasiocarpa/Thalictrum occidentale h.t.	609	Abla/Thoc h.t.	83
27. Abies lasiocarpa/Spiraea betulifolia h.t.	705	Abla/Spbe h.t.	85
28. Abies lasiocarpa/Vaccinium scoparium h.t.	730	Abla/Vasc h.t.	87
a. Calamagrostis rubescens phase	731	Caru phase	87
b. Pinus albicaulis phase	734	Pial phase	87
c. Vaccinium scoparium phase	732	Vasc phase	87
29. Abies lasiocarpa/Arnica latifolia h.t.	701	Abla/Arla h.t.	89
30. Abies lasiocarpa/Osmorhiza chilensis h.t.	760	Abla/Osch h.t.	91
a. Pachistima myrsinites phase	761	Pamy phase	91
b. Osmorhiza chilensis phase	762	Osch phase	91
31. Abies lasiocarpa/Calamagrostis rubescens h.t.	750	Abla/Caru h.t.	93
a. Pachistima myrsinites phase	752	Pamy phase	93
b. Calamagrostis rubescens phase	751	Caru phase	93
32. Abies lasiocarpa/Berberis repens h.t.	703	Abla/Bere h.t.	95
33. Abies lasiocarpa/Ribes montigenum h.t.	810	Abla/Rimo h.t.	97
34. Abies lasiocarpa/Pedicularis racemosa h.t.	707	Abla/Pera h.t.	99
35. Abies lasiocarpa/Arnica cordifolia h.t.	780	Abla/Arco h.t.	101
a. Astragalus miser phase	782	Asmi phase	101
b. Arnica cordifolia phase	781	Arco phase	101
E. Pinus albicaulis Series	870		102
F. Pinus contorta Series	900		103
G. Populus tremuloides Series	990		112

A. REQUIREMENTS FOR USING THE KEYS

In order to utilize the keys properly certain requirements must be met:

1. The key is intended for stands with a mature tree canopy not severely disturbed by grazing, logging, fire, etc. If the stand is severely disturbed or in a very young successional stage, the habitat type can best be determined by extrapolation from the nearest mature, undisturbed stand having similar abiotic features.

2. Accurate identification and canopy-coverage estimation is required for all indicator species (Appendix D) in the stand.

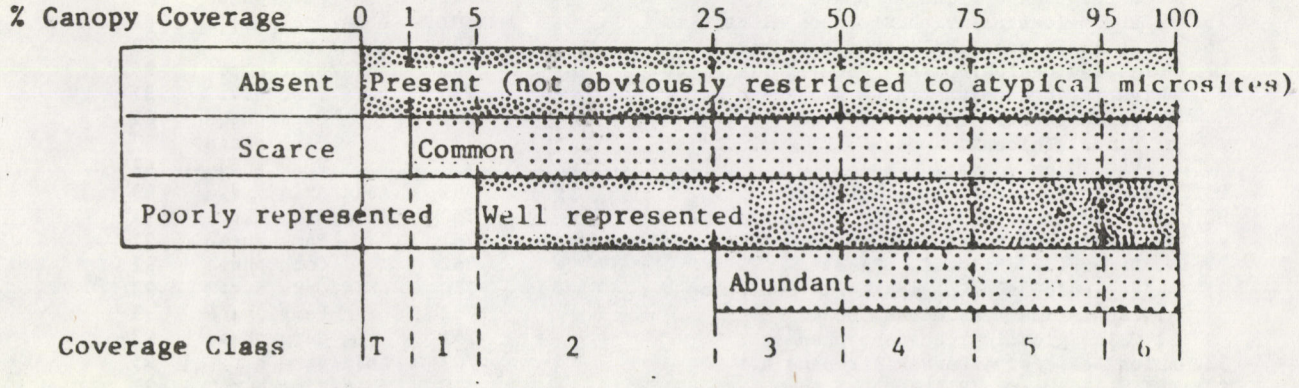
3. Plot data should be checked in the field to verify that the plot is representative of the stand as a whole. If not, take another plot.

4. Identify the correct potential climax tree species in the SERIES key. Generally, a tree species is considered reproducing successfully if data and observations indicate that at least 10 per acre occupy, or will occupy, the site.

5. Within the appropriate Series, key to HABITAT TYPE by following the key literally. Phases under certain habitat types are listed in preferential order; the first phase meeting stand conditions is the correct choice. The terminology in the key is based strictly on the relationships shown in Figure 2. If there is difficulty deciding between types, refer to constancy and coverage data (Appendix B) and the habitat type description to aid in making the decision.

6. The key is not the classification! Determinations made using the key should be validated by checking the written description.

Figure 2. Terminology in relation to canopy coverage classes.



* Note! In stands where undergrowth is obviously depauperate (unusually sparse) because of dense shading or duff accumulations, the above definitions may be adjusted to the next lower coverage class (e.g., well represented > 1%, common > 0%).

B. KEY TO CLIMAX SERIES

1. Abies lasiocarpa present and reproducing successfully.
ABIES LASIOCARPA SERIES (p. 62)

1. Abies lasiocarpa not the indicated climax dominant 2

2. Picea spp. present and reproducing successfully.
PICEA SERIES (p. 49)

2. Picea not the indicated climax dominant 3

3. Pinus flexilis a successfully reproducing dominant in old growth stands; often sharing that status with Pseudotsuga.
PINUS FLEXILIS SERIES (p. 16)

3. Pinus flexilis absent or clearly seral 4

4. Pseudotsuga menziesii present and reproducing successfully.
PSEUDOTSUGA MENZIESII SERIES (p. 20)

4. Pseudotsuga menziesii not the indicated climax dominant . . . 5

5. Pinus albicaulis well represented and reproducing successfully.
PINUS ALBICAULIS SERIES (p.102)

5. Pinus albicaulis not the indicated successional dominant . 6

6. Pinus contorta dominant and reproducing successfully.
PINUS CONTORTA SERIES (p.103)

6. Pinus contorta not the indicated successional dominant 7

7. Populus tremuloides the indicated dominant.
POPULUS TREMULOIDES SERIES (p.112)

7. P. tremuloides not the indicated dominant. Juniperus osteosperma or Acer grandidentatum dominating the site.
MINOR VEGETATION TYPES (p.113)

C. PINUS FLEXILIS SERIES

The Pinus flexilis series appears in small amounts throughout much of the study area and often represents the driest sites of the coniferous forest near lower timberline. It may also extend to relatively high elevations on exposed windy aspects where it meets P. albicaulis near upper timberline (Reed, 1969). Most of these sites represent topoedaphic conditions with possible exceptions near Ririe, Idaho (Cooper, 1975) and the southern tip of the Wind River Mountains. Normally its best development is on calcareous substrates.

Pinus flexilis may be the only tree present but more often it co-dominates the site with Pseudotsuga. Crown competition between these species is minimal because the trees are widely spaced. Most undergrowths resemble adjacent mountain shrub or steppe communities.

These sites have little potential for producing timber. Regeneration of both Pinus and Pseudotsuga is sporadic and their growth rates and stockability are low. In most cases, the resources for grazing and wildlife outweigh other values.

Key to Pinus flexilis Habitat Types

1. Juniperus communis well represented.
   PINUS FLEXILIS/JUNIPERUS COMMUNIS H.T. (p. 5)

1. J. communis poorly represented 2

   2. Cercocarpus ledifolius well represented.
      PINUS FLEXILIS/CERCOCARPUS LEDIFOLIUS H.T. (p. 7)

   2. C. ledifolius poorly represented 3

      3. Festuca idahoensis well represented.
         PINUS FLEXILIS/FESTUCA IDAHOENSIS H.T. (p. 15)

      3. F. idahoensis poorly represented, Hesperochloa kingii (Leucopoa kingii) common.
         PINUS FLEXILIS/HESPEROCHLOA KINGII H.T. (p. 19)

Incidental Habitat Types in the Pinus flexilis Series

Pinus flexilis/Juniperus communis h.t.
(Pifl/Juco h.t.; limber pine/common juniper)

The Pifl/Juco h.t. occurs sporadically from the Lemhi Mountains to south central Monana. Open stands of Pinus flexilis and Pseudotsuga codominate scattered patches of Juniperus communis. Forbs are normally sparse with Astragalus miser being the most common. Pfister and others (1977) describe this h.t. in greater detail for central Montana.

Pinus flexilis/Festuca idahoensis h.t.
(Pifl/Feid h.t.; limber pine/Idaho fescue)

This h.t. appears in small amounts from the Lemhi and Lost River Mountains to central Montana and southward to western Wyoming. Pinus flexilis and usually Pseudotsuga create a broken canopy over a bunchgrass community. Festuca idahoensis normally codominates with Agropyron spicatum or Hesperochloa kingii. This h.t. is further described for east central Idaho (Steele and others, 1975) and Montana (Pfister and others, 1977).

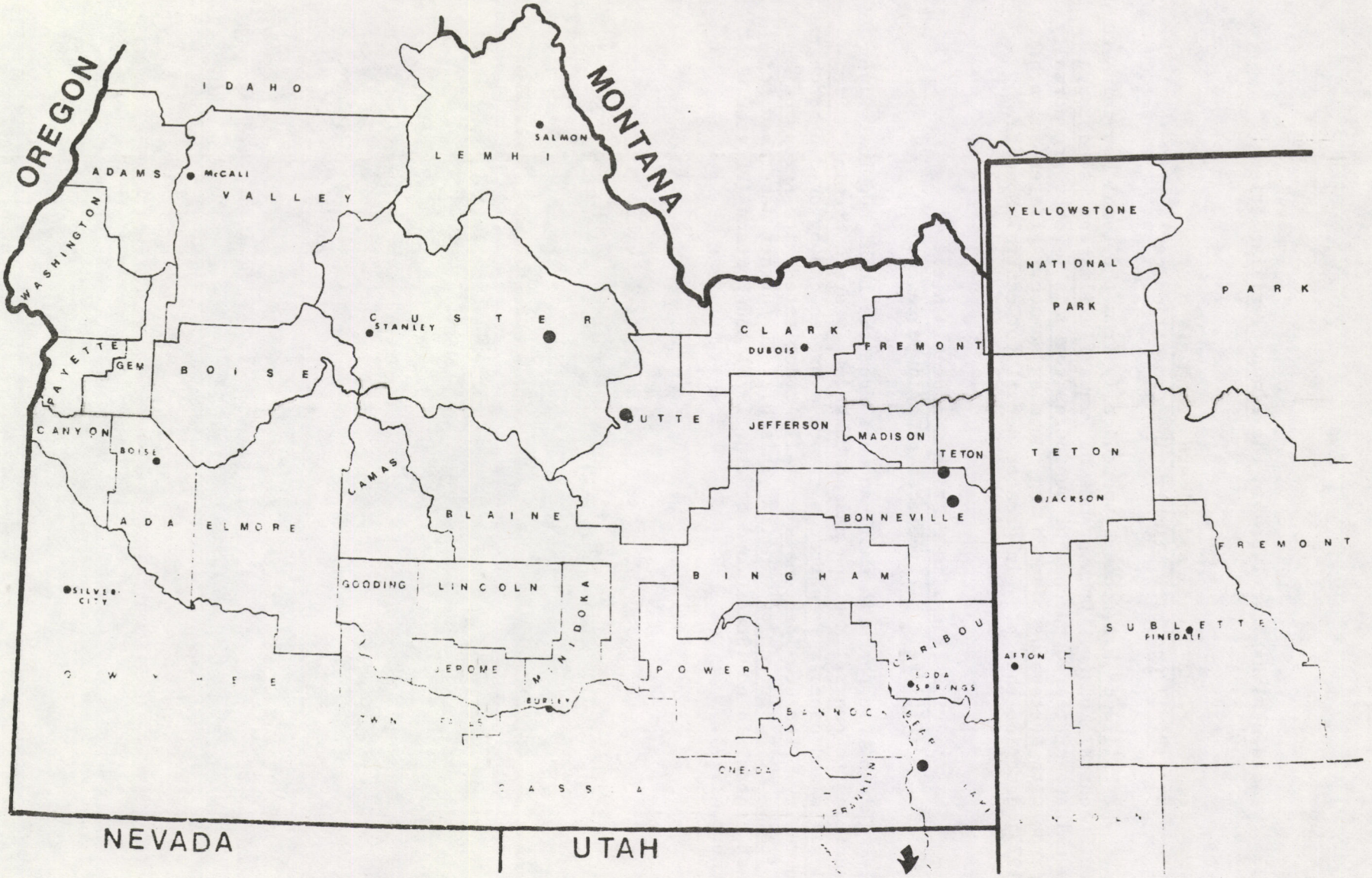


Fig. 3. Known locations of the Pinus flexilis Cercocarpus ledifolius h.t.

Pinus flexilis/Cercocarpus ledifolius h.t.
(Pifl/Cele h.t.; limber pine/curl-leaf mountain-mahogany)

Pifl/Cele is a minor h.t. that ranges from east central Idaho southward to the Wasatch Mountains of northern Utah (Fig. 3). It usually occupies southerly aspects that merge with Cercocarpus dominated communities.

Open stands of Pinus flexilis, often with Pseudotsuga, dominate a layer of Cercocarpus. Berberis repens and Symphoricarpos oreophilus are common lesser shrubs and Juniperus scopulorum may be present in various amounts. The most common grasses are Hesperochloa kingii and Agropyron spicatum.

Tree growth is very slow in this h.t. and regeneration is sporadic. Existing trees have their greatest value as a food source and shelter for wildlife. The Cercocarpus provides big game with important browse and winter protection but may limit production of forbs and grasses.

The Pifl/Cele h.t. was previously recognized in northern Utah and adjacent Idaho (Henderson and others, 1976).

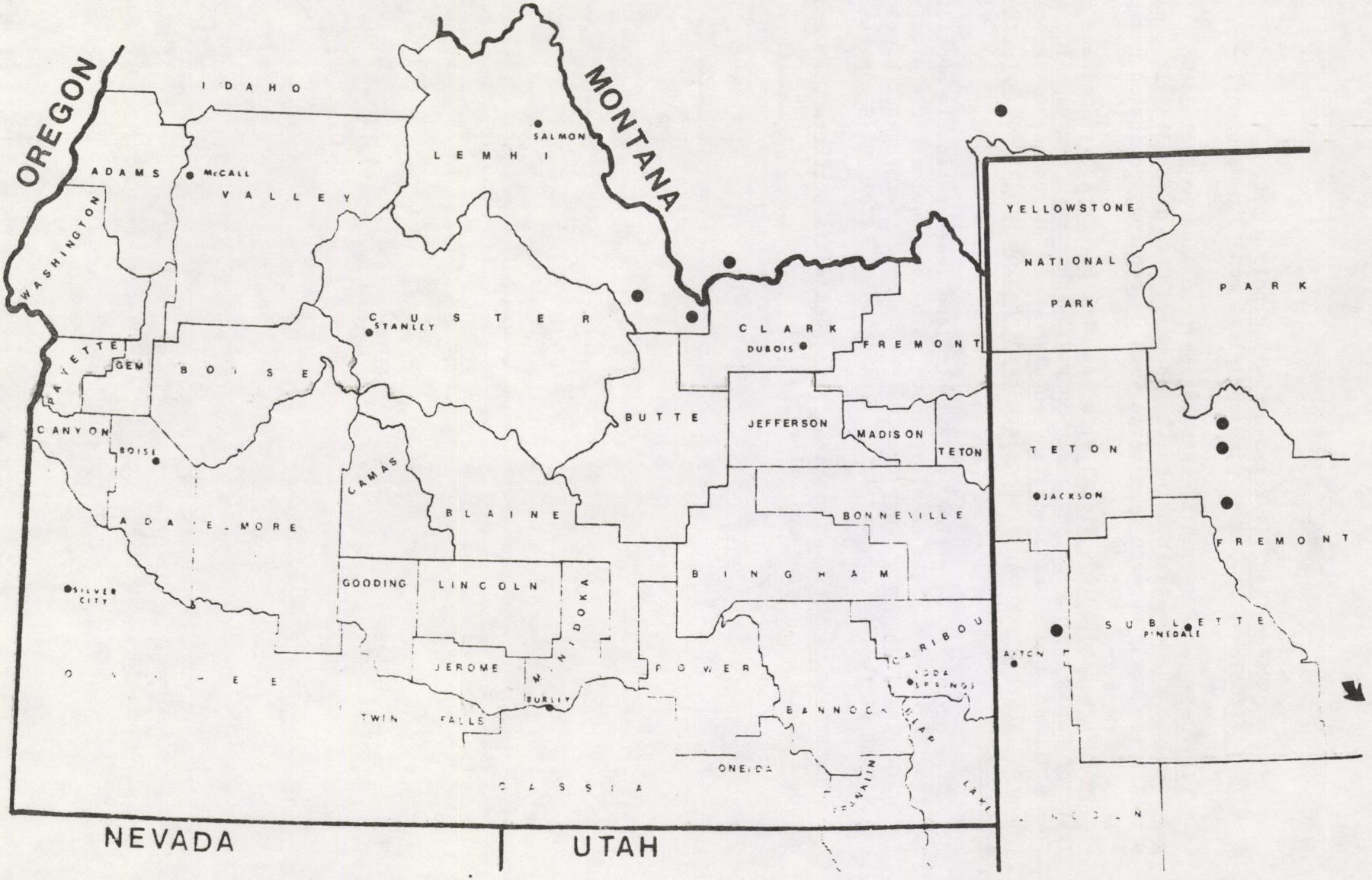


Fig. 4. Known locations of the Pinus flexilis Hesperochloa kingii h.t.

Pinus flexilis/Hesperochloa kingii h.t.
(*Pifl/Heki* h.t.; limber pine/spike-fescue)

The *Pifl/Heki* h.t. is perhaps the most common *Pinus flexilis* h.t. in our area. It extends from the southern Lemhi Mountains and extreme southern Montana through eastern Idaho to southeastern Wyoming (Fig. 4). This h.t. normally occupies severe windy sites having southerly aspects. It usually borders nonforest communities in areas that have *Abies* or *Picea* on steep north slopes.

Widely spaced *Pinus flexilis* with various amounts of *Pseudotsuga* dominate a bunchgrass undergrowth. The overall appearance is of a savanna with *Hesperochloa kingii* and usually *Agropyron spicatum* as co-dominant grasses.

Growth rates and stockability of trees are very low in this h.t. (Appendix C-3). Regeneration is unpredictable. Wildlife and forage values generally outweigh other resources on these sites.

This h.t. has been described in southeastern Wyoming (Wirsing and Alexander, 1975) and in northwestern Wyoming as the *Pseudotsuga menziesii - Pinus flexilis/ Hesperochloa kingii* h.t. (Cooper, 1975). Pfister and others (1977) note that the portion of their *Pinus flexilis/Agropyron spicatum* h.t. in southern Montana also relates to the above conditions.

D. PSEUDOTSUGA MENZIESII SERIES

Throughout much of the study area, Pseudotsuga menziesii forms the lower timberline. Here it merges with mountain shrub or steppe vegetation and may create a savanna either individually or as part of the Pinus flexilis series. At its cool, moist limits, the Pseudotsuga series meets the Abies lasiocarpa series.

Pinus contorta is the major seral conifer in this series with small amounts of Pinus flexilis appearing in some h.t.s. In a few h.t.s Populus tremuloides dominates seral stands, but in many areas only Pseudotsuga appears capable of occupying the site.

Several Pseudotsuga h.t.s in the study area bear the same name as some h.t.s in west central Idaho (e.g. Psme/Phma, Psme/Syal, Psme/Spbe). These h.t.s should be considered as eastern variants of the original types and management guidelines for these variants should be developed separately. Other h.t.s with the same name that occur in east central Idaho (e.g. Psme/Juco, Psme/Arco, Psme/Syor) appear similar enough to be considered as single entities. Future studies will probably denote these differences and similarities with appropriate nomenclature.

As Cooper (1975) previously noted, several species characteristic of Pseudotsuga h.t.s become scarce in parts of the study area. Symphoricarpos oreophilus, a ubiquitous species of Pseudotsuga h.t.s in central and southern Idaho, is largely absent in the northeastern portion of the study area. Calamagrostis rubescens, a very widespread species, becomes scarce in eastern portions of the study area and is absent throughout much of the Wind River Range. Pachistima myrsinites extending northward from Utah and Colorado shows good development north to about Driggs, Idaho. It also has spotty occurrences in Yellowstone Park and near Hebgen Lake in southern Montana. The geographic limits of these indicator species, some occurring in opposing directions, reflect the convergence of several physicgraphic and floristic units within the study area.

Key to *Pseudotsuga menziesii* Habitat Types

1. *Physocarpus malvaceus* well represented.
   PSEUDOTSUGA MENZIESII/PHYSOCARPUS MALVACEUS H.T. (p.25)

1. *P. malvaceus* poorly represented 2

   2. *Acer glabrum* well represented.
      PSEUDOTSUGA MENZIESII/ACER GLABRUM H.T. (p.27)
      2a. *Pachistima myrsinites* or *Berberis repens* usually present.
         PACHISTIMA MYRSINITES PHASE (p.27)
      2b. *Symphoricarpos oreophilus* and *Ribes cereum* usually present.
         SYMPHORICARPOS OREOPHILUS PHASE (p.27)

   2. *A. glabrum* poorly represented 3

      3. *Vaccinium globulare* well represented.
         PSEUDOTSUGA MENZIESII/VACCINIUM GLOBULARE H.T. (p.29)

      3. *V. globulare* poorly represented 4

         4. *Symphoricarpos albus* well represented.
            PSEUDOTSUGA MENZIESII/SYMPHORICARPOS ALBUS H.T. (p.31)

         4. *S. albus* poorly represented 5

            5. *Spiraea betulifolia* well represented.
               PSEUDOTSUGA MENZIESII/SPIRAEA BETULIFOLIA H.T. (p.33)
               5a. *Calamagrostis rubescens* or *Carex geyeri* well represented.
                  CALAMAGROSTIS RUBESCENS PHASE (p.33)
               5b. *C. rubescens* and *C. geyeri* poorly represented.
                  SPIRAEA BETULIFOLIA PHASE (p.33)

            5. *S. betulifolia* poorly represented 6

               6. *Osmorhiza chilensis* or *O. depauperata* well represented.
                  PSEUDOTSUGA MENZIESII/OSMORHIZA CHILENSIS H.T. (p.35)

               6. *O. chilensis* and *O. depauperata* poorly represented ... 7

                  7. *Calamagrostis rubescens* well represented.
                     PSEUDOTSUGA MENZIESII/CALAMAGROSTIS RUBESCENS H.T. (p.37)
                     7a. *Pachistima myrsinites* well represented.
                        PACHISTIMA MYRSINITES PHASE (p.37)
                     7b. *P. myrsinites* poorly represented.
                        CALAMAGROSTIS RUBESCENS PHASE (p.37)

                  7. *C. rubescens* poorly represented 8

8. Carex geyeri well represented.
PSEUDOTSUGA MENZIESII/CAREX GEYERI H.T. (p.23)

8. C. geyeri poorly represented 9

9. Juniperus communis well represented.
PSEUDOTSUGA MENZIESII/JUNIPERUS COMMUNIS H.T. (p.39)

9. J. communis poorly represented 10

10. Cercocarpus ledifolius well represented and the indicated climax dominant shrub.
PSEUDOTSUGA MENZIESII/CERCOCARPUS LEDIFOLIUS H.T. (p.41)

10. C. ledifolius poorly represented or seral 11

11. Berberis repens or Pachistima myrsinites well represented.
PSEUDOTSUGA MENZIESII/BERBERIS REPENS H.T. (p.43)

11. B. repens and P. myrsinites poorly represented 12

12. Arnica cordifolia or Astragulus miser well represented or the dominant forbs of normally depauperate undergrowths.
PSEUDOTSUGA MENZIESII/ARNICA CORDIFOLIA H.T. (p.45)
12a. Arnica cordifolia well represented.
ARNICA CORDIFOLIA PHASE (p.45)
12b. A. cordifolia poorly represented; Astragalus miser well represented.
ASTRAGALUS MISER PHASE (p.45)

12. A. cordifolia and A. miser poorly represented; Symphoricarpos oreophilus well represented
PSEUDOTSUGA MENZIESII/SYMPHORICARPOS OREOPHILUS H.T. (p.47)

Incidental Habitat Types in the *Pseudotsuga menziesii* Series

Pseudotsuga menziesii/Carex geyeri h.t.
(*Psme/Cage* h.t.; Douglas-fir/elksedge)

Small amounts of this h.t. occur in the Centennial Mtns. and Henrys Lake Mtns. (Cooper, 1975) and occasionally elsewhere in the study area. In most respects it resembles a *Psme/Caru* h.t. except the *Calamagrostis* is replaced by *Carex*. Management implications and growth responses should be similar to the *Psme/Caru* h.t., however productivity is often less. The *Psme/Cage* h.t. is characteristic of coarse granitic soils in central Idaho and is described further by Steele and others (1975).

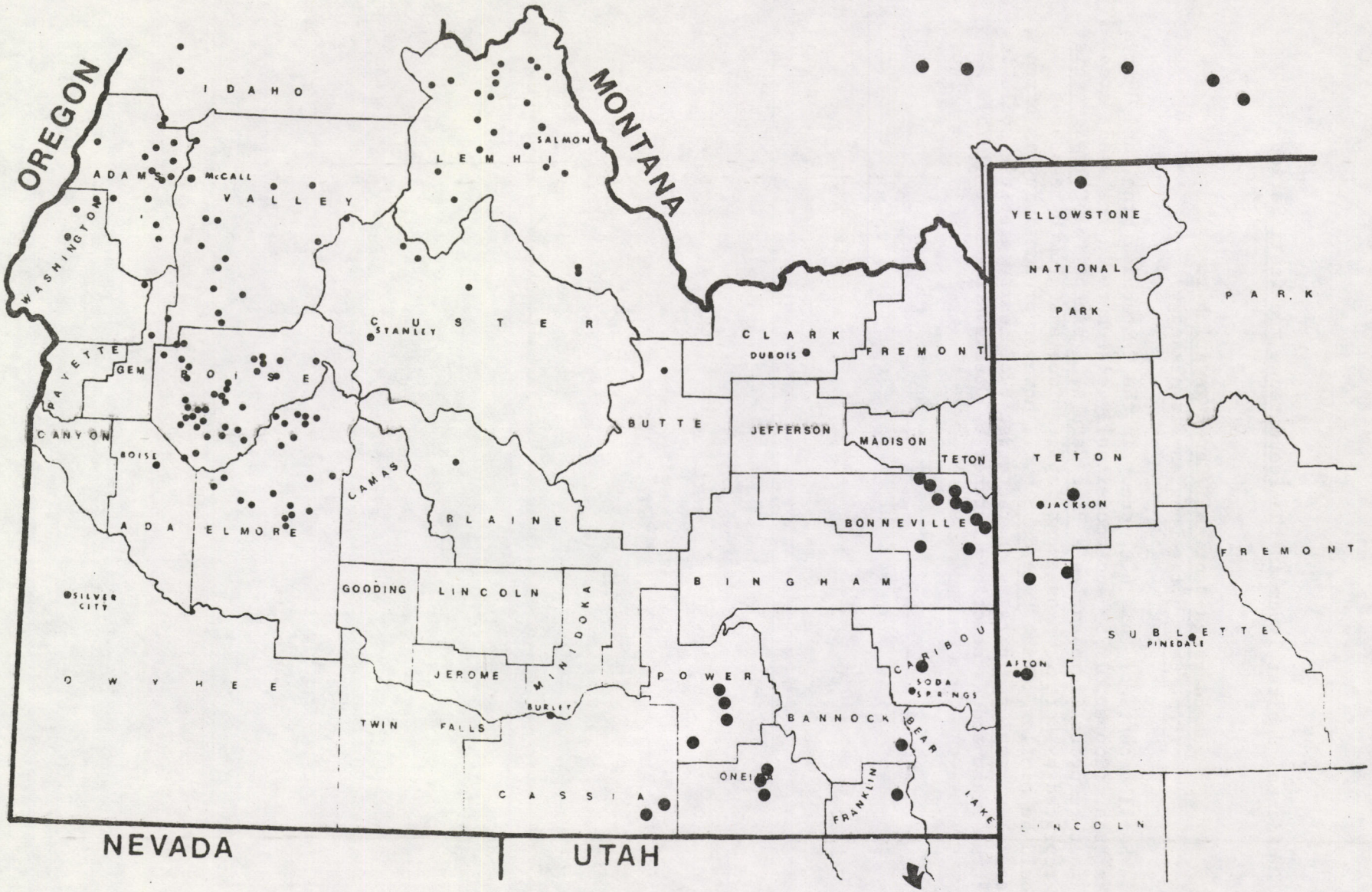


Fig. 5. Known locations of the Pseudotsuga menziesii/Physocarpus malvaceus h.t., eastern variant (●); western variant (•).

Pseudotsuga menziesii/Physocarpus malvaceus h.t. (eastern variant) (Psme/Phma h.t.; Douglas-fir/ninebark)

The Psme/Phma h.t. is most common at lower elevations in the Snake, Hoback, and Greys river drainages (Fig. 5). It also occurs in the Yellowstone River drainage (Cooper, 1975) and intermittently southward into Utah (Henderson and others, 1976). It occurs mostly on relatively steep slopes with northerly or protected aspects. The Psme/Phma h.t. in western Montana (Pfister and others, 1977) and central Idaho (Steele and others, 1975) should be considered a separate entity from that described herein.

Normally Pseudotsuga dominates both seral and old growth stands. Small amounts of Pinus flexilis and occasionally Populus tremuloides may be present in seral stands. Physocarpus malvaceus usually forms a heavy layer over lesser amounts of Symphoricarpos albus and Spiraea betulifolia. Pachistima is usually present in the stand and is often well represented.

Pseudotsuga appears to regenerate easily in this h.t. but growth rates are low to moderate (Appendix C-3). If the tree canopy is removed, the shrub layer may increase and suppress conifer seedlings. Domestic livestock find little forage here but big game may use these sites for cover and escape.

Cooper (1975) and Henderson and others (1976) have previously described this h.t. within the study area. A Psme/Phma h.t. also is reported in Montana (Pfister and others, 1977), central Idaho (Steele and others, 1975) and northern Idaho (Daubenmire and Daubenmire, 1968). Hoffman and Alexander (1976) report a Pseudotsuga menziesii/Physocarpus monogynus h.t. in the Bighorn Mountains that resembles the Psme/Phma h.t.

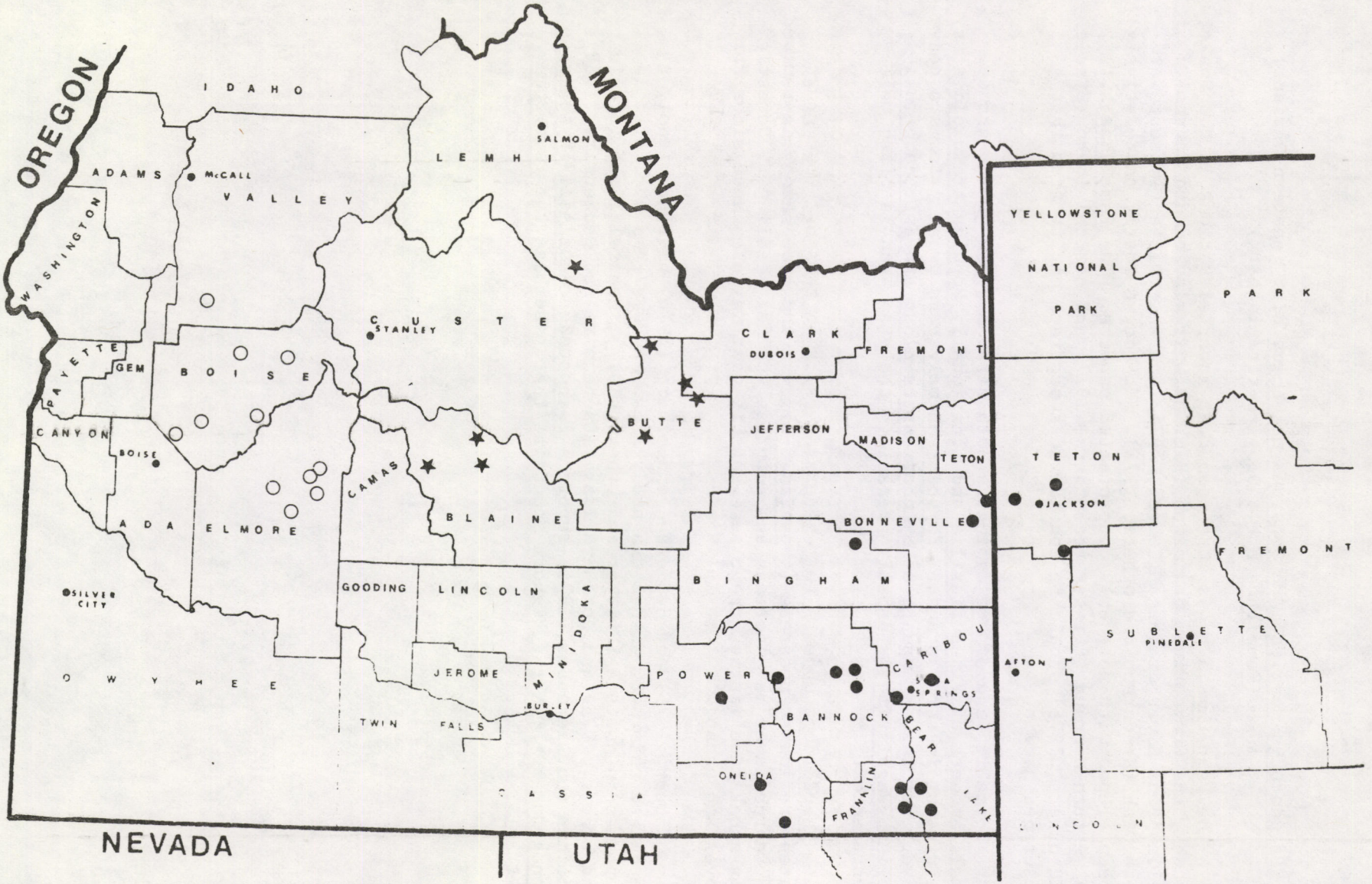


Fig. 6. Known locations of the Pseudotsuga menziesii/Acer glabrum h.t., Pachistima myrsinites phase (●); Symphoricarpos oreophilus phase (★); Acer glabrum phase (○).

Pseudotsuga menziesii/Acer glabrum h.t. (Psme/Acgl h.t.; Douglas-fir/mountain maple)

The Psme/Acgl h.t. occurs mainly in the southern half of our study area and in central Idaho (Fig. 6). It occupies cool moist environments in the Pseudotsuga zone and usually occurs on northerly aspects that are often quite steep. Three geographically distinct phases are recognized within this h.t. Two of these occur in the study area as described below. The third phase (Acer glabrum phase) occurs in west central Idaho and follows the original description of the h.t. (Steele et al., 1975).

Pachistima myrsinites phase (Psme/Acgl h.t., Pamy phase)

This phase occurs mainly in the southeast corner of Idaho and in northern Utah (Fig. 6). Small amounts of Populus tremuloides and occasionally Pinus contorta may be present but usually Pseudotsuga is the only tree on the site. A tall layer of Acer glabrum, Sorbus, Amelanchier and Prunus dominates the undergrowth. Pachistima or Berberis are usually present though often sparse. Numerous forbs are usually present of which Osmorhiza, Arnica and Galium triflorum are most common. Calamagrostis rubescens or Carex geyeri are often conspicuous. This phase may represent the most mesic uplands in the area or it may border the Abla/Acgl or Abla/Acru h.t.s. Adjacent drier sites are usually Psme/Osch or Psme/Caru h.t.s or sometimes Acer grandidentatum communities.

Symphoricarpos oreophilus phase (Psme/Acgl h.t., Syor phase)

This minor phase is found mainly in the Lemhi Mountains and occasionally westward to the Wood River drainage (Fig. 6). Eventually it may be found in the Wind River Mountains which have some floristic similarities with the Lemhi range. Small amounts of Pinus flexilis are common in this phase but Pseudotsuga is the only tree capable of dominating the site. Acer glabrum is well represented in a sparse layer of medium to tall shrubs. Of these, Symphoricarpos oreophilus and Ribes cereum are most common. Pachistima, Osmorhiza, Galium and Calamagrostis are normally absent. Substrates are usually very stoney sedimentaries. This phase usually represents the most mesic uplands in the area and borders a Psme/Syor or Psme/Cele h.t.

Timber productivity potential is low in the Syor phase and moderate in the Pamy phase (Appendix C-3). Overstory removal will stimulate development of a tall shrub layer that is beneficial to big game but may suppress conifer seedlings. Domestic livestock seldom use these sites because of the steep slopes and the more desirable forage in adjacent areas.

Henderson and others (1976) previously described the Pamy phase of this h.t. within the study area. The Syor phase has not been recognized in other studies.

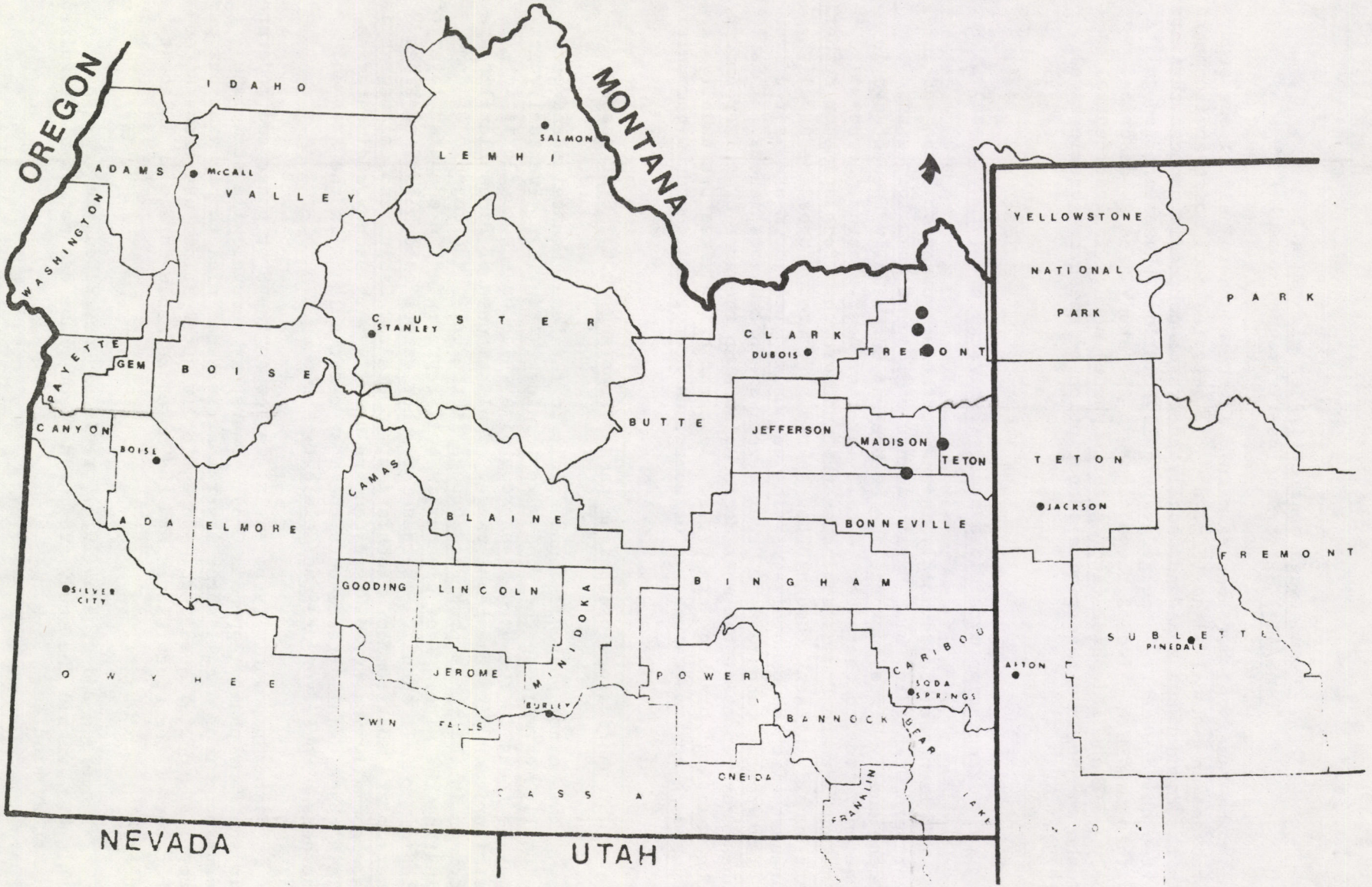


Fig. 7. Known locations of the Pseudotsuga menziesii/Vaccinium globulare h.t.

Pseudotsuga menziesii/Vaccinium globulare h.t. (*Psme/Vagl* h.t.; Douglas-fir/tall huckleberry)

This minor h.t. was found on the Targhee National Forest from the Centennial Mountains south to the Snake River Range and on the east side of the Teton Range (Fig. 7). It occurs on moderately steep slopes having northerly aspects.

Pinus contorta is a major seral tree in this h.t. and usually invades following fire. *Pseudotsuga* is the only other tree normally found here. *Vaccinium globulare* usually dominates a shrubby undergrowth that includes *Spiraea betulifolia* and *Lonicera utahensis*. *Calamagrostis rubescens* is usually present in various amounts.

Pinus contorta should regenerate readily wherever the tree canopy is removed and a seedbed is available. *Pseudotsuga* seedlings may benefit from a light tree canopy but the undergrowth of shrubs and grass may impede their establishment. In summer and fall big game may seek food and cover on these gentle northerly aspects and the fall berry crops attract bears, grouse and humans.

Cooper (1975) first described the *Psme/Vagl* h.t. from this area. This h.t. was also found in several parts of Montana (Pfister and others, 1974).

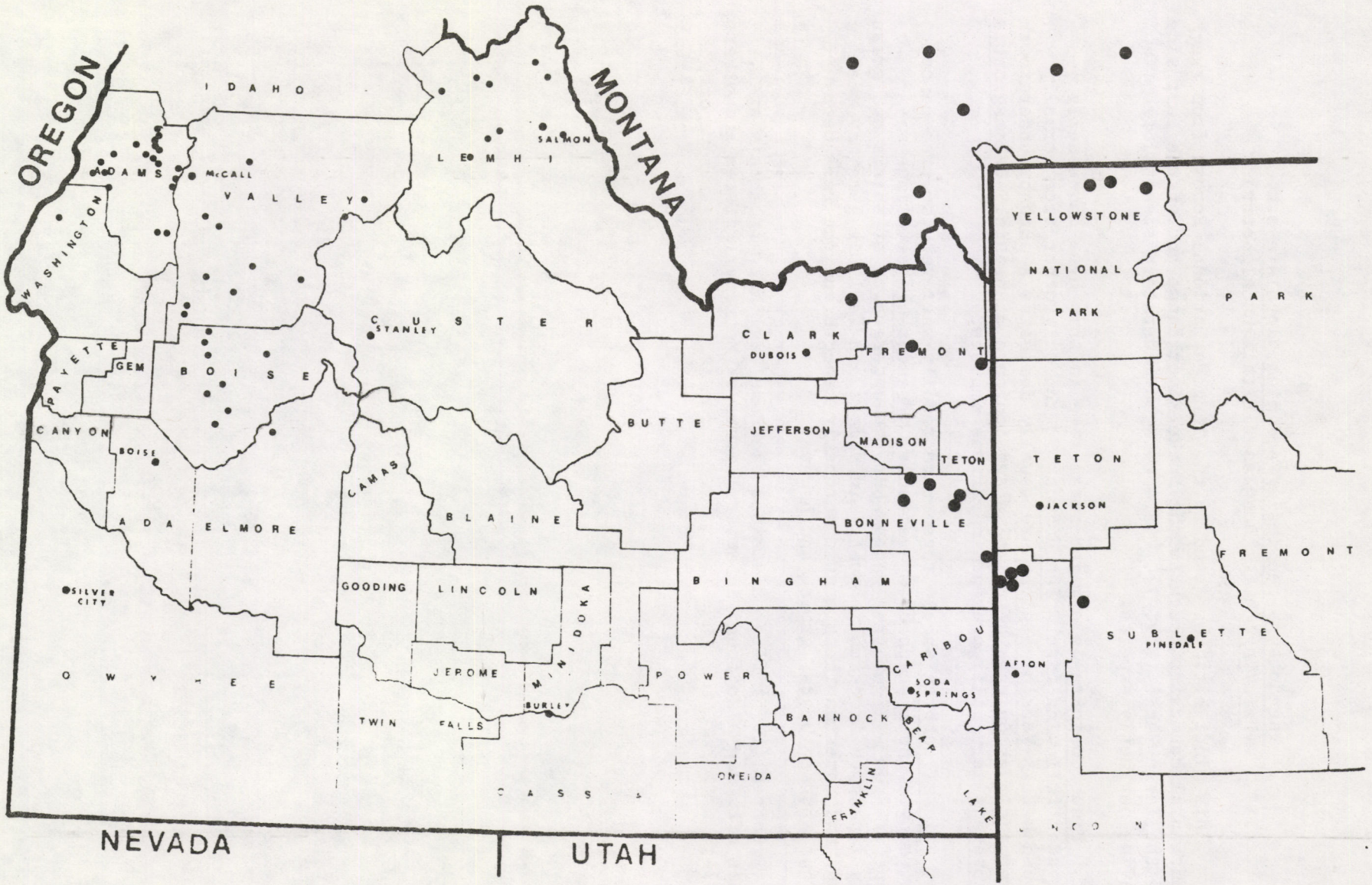


Fig. 8. Known locations of the Pseudotsuga menziesii/Symphoricarpos albus h.t , eastern variant (●); western variant (•).

Pseudotsuga menziesii/*Symphoricarpos albus* h.t. (*Psme*/*Syal* h.t.; Douglas-fir/common snowberry)

The *Psme*/*Syal* h.t. occurs from about Palisades Reservoir northward to Yellowstone National Park and southcentral Montana (Fig. 8). (The *Psme*/*Syal* h.t. described in central Idaho (Steele and others, 1975) and west of the Continental Divide in Montana (Pfister and others, 1977) should be considered a separate entity from that described herein.) It occupies lower slopes and benches having relatively mild climates and deep moist soils. It appears most often on southerly to easterly aspects and usually borders an *Abies lasiocarpa* h.t. on the cooler moist sites. Adjacent drier sites are usually a *Psme*/*Caru* h.t. or a nonforest community.

Populus tremuloides and small amounts of *Pinus flexilis* are the common seral trees. Occasionally *Pinus contorta* is also present. Usually *Symphoricarpos albus* forms a low shrub layer with *Spiraea betulifolia* and *Berberis repens*. *Prunus* and *Amelanchier* are often present.

Timber productivity potential ranges from low to moderate (Appendix C-3). If present, *Populus tremuloides* may increase rapidly after the conifers are removed and retard regeneration of *Pseudotsuga*. In some areas, the gentle slopes and relatively mild climate provide important wintering areas for big game. Domestic livestock show little preference for this h.t. but may use it as a resting area if available.

Cooper (1975) first described a *Psme*/*Syal* h.t. for this area but defined a much broader unit than recognized here.

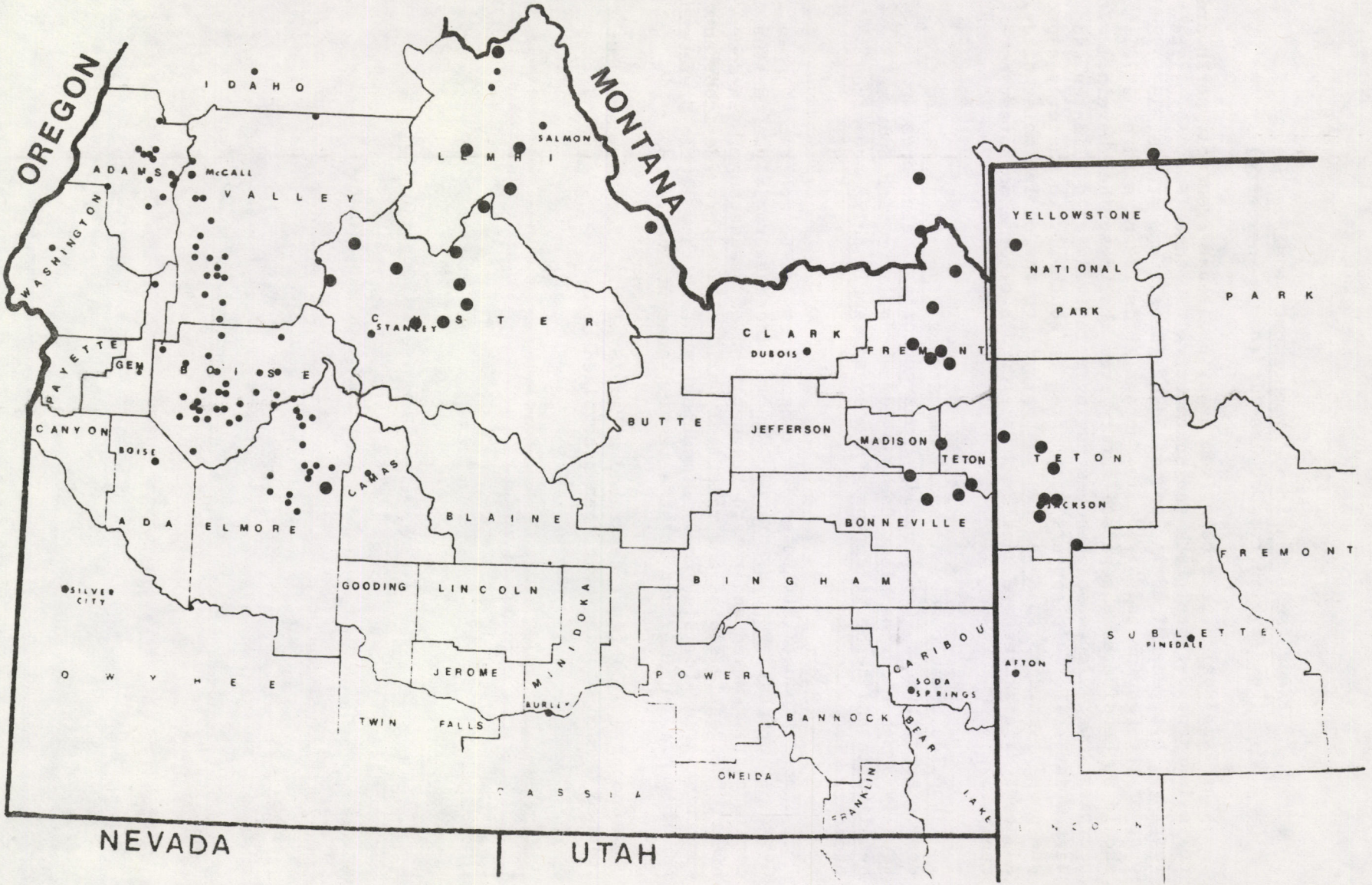


Fig. 9. Known locations of the Pseudotsuga menziesii/Spiraea betulifolia h.t., eastern variant (all phases) (●); western variant (all phases) (•).

Pseudotsuga menziesii/Spiraea betulifolia h.t. (Psme/Spbe h.t.; Douglas-fir/white spiraea)

The Psme/Spbe h.t. occurs from about Palisades Reservoir northward to Yellowstone Park. Closely related conditions also appear in east central Idaho (Fig. 9). (A Psme/Spbe h.t. in west central Idaho (Steele and others, 1975) and in Montana (Pfister and others, 1977) which occurs at lower elevations and supports Pinus ponderosa should be considered a separate entity.) In our area, the Psme/Spbe h.t. appears mostly on upper slopes and ridges having southerly aspects. It normally represents the mid to lower segment of the Pseudotsuga zone.

Occasionally Pinus contorta grows here as a seral species and small amounts of Pinus flexilis may be present. Populus tremuloides may occur in small amounts but shows limited potential for colonizing the site. Normally Spiraea betulifolia is a major component of a low shrub layer that sometimes includes high coverages of Pachistima. Lesser amounts of Amelanchier and Symphoricarpos oreophilus are also common.

Calamagrostis rubescens phase (Psme/Spbe h.t., Caru phase)

A conspicuous layer of Calamagrostis rubescens often mixed with Carex geyeri is the characteristic feature of this phase. This condition apparently represents a somewhat different soils condition and possibly cooler temperatures. It is often transitional to a Psme/Caru or Abla/Caru h.t. Other features correspond to those given above.

Spiraea betulifolia phase (Psme/Spbe h.t., Spbe phase)

This phase can occur in the same general area as the Caru phase. It conforms to the above description of the h.t.

Timber productivity potential is low to moderate (Appendix C-3). Pseudotsuga is the only suitable timber species for many of these sites and may require careful site preparation for adequate restocking. Seedlings may also need some protection from wind or sun. If present, Pinus contorta may be a more feasible species for regenerating the stand. Most of these sites receive light use from big game, and in some areas they receive heavy winter use. Domestic livestock use this h.t. sparingly.

This h.t. has not been previously described in our area, but was included as part of Cooper's (1975) Psme/Syal h.t.

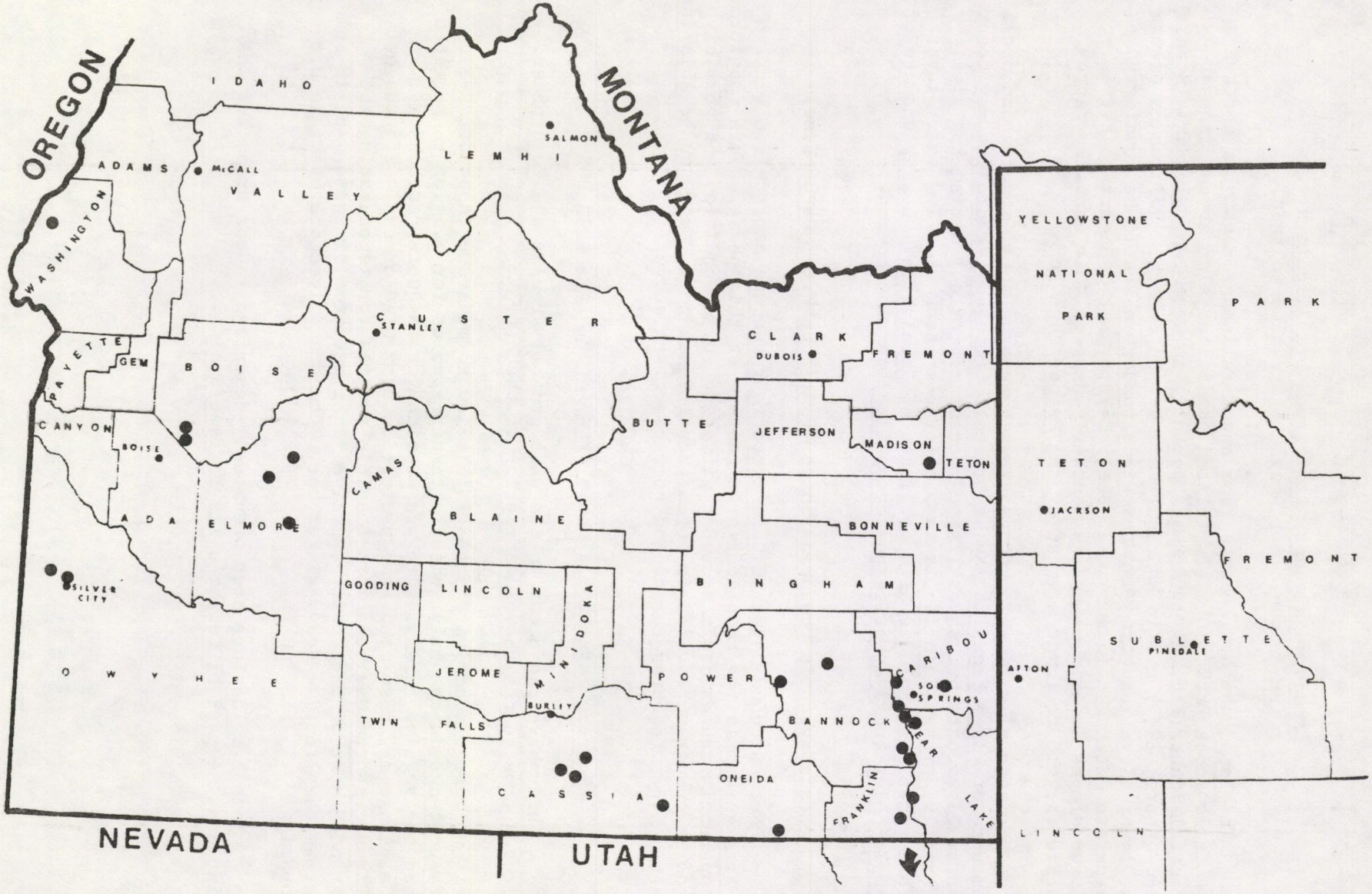


Fig. 10. Known locations of the Pseudotsuga menziesii/Osmorhiza chilensis h.t.

Pseudotsuga menziesii/Osmorhiza chilensis h.t. (Psme/Osch h.t.; Douglas-fir/mountain sweet-root)

The Psme/Osch h.t. occurs across the southern portion of Idaho (Fig. 10). It usually appears on the leeward slopes of ridges that are adjacent to the Snake River Plain or related desert. The slopes in general are moderate to steep and have northerly aspects. Most sites occur near lower timberline and adjacent warmer sites are often non-forested.

Normally Pseudotsuga is the only conifer on these sites although an occasional Abies lasiocarpa may be present. Populus tremuloides and sometimes Pinus contorta may dominate seral stands. Members of adjacent mountain shrub communities may also invade disturbed sites. Osmorhiza chilensis or sometimes O. depauperata usually dominates a layer of forbs that includes Smilacina racemosa and Viola nuttallii. The moss, Eurhynchium pulchellum, appeared frequently in this h.t., particularly on the bases of trees. When the Psme/Caru or Psme/Cage h.t. is nearby on drier sites, the Calamagrostis or Carex may be well represented, especially in younger stands.

Timber productivity ranges from moderate to high in this h.t. (Appendix C-3). Pseudotsuga is often the only conifer adapted to the site and regenerates easily in the shade of older trees. If present, Populus tremuloides can quickly dominate cleared areas in this h.t. Pocket gophers are sometimes numerous and can pose a threat to young trees. Domestic livestock often use these sites for resting and shelter but seldom find much forage here. Big game use is normally light but may increase in early seral stages.

This h.t. was first described in the southern Sawtooth National Forest (Steele and others, 1974) and subsequently recognized by Henderson and others (1975) in our area. No other studies have reported this h.t.

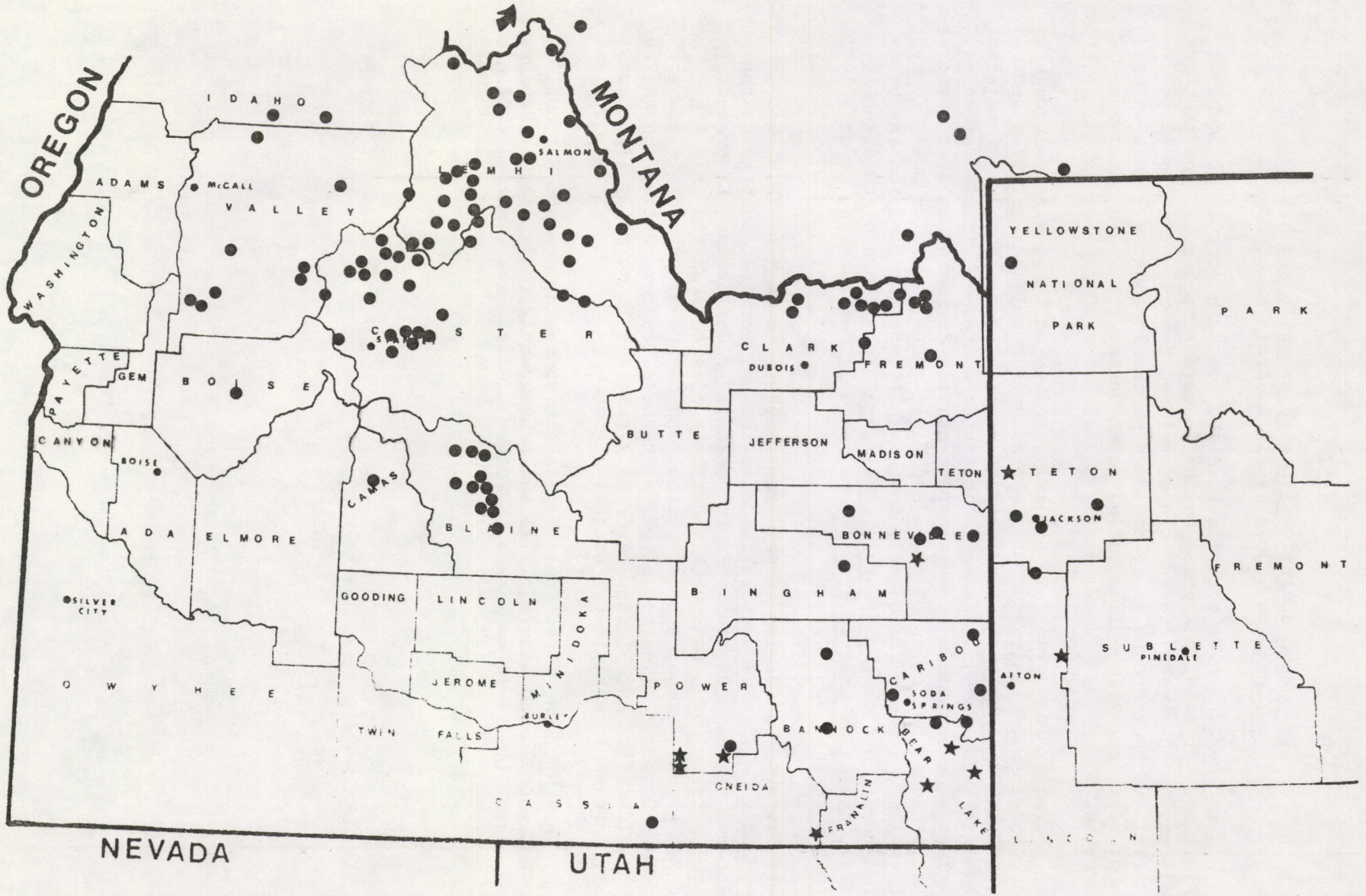


Fig. 11. Known locations of the Pseudotsuga menziesii/Calamagrostis rubescens h.t., Pachistima myrsinites phase (★); Calamagrostis rubescens phase (●).

Pseudotsuga menziesii/Calamagrostis rubescens (Psme/Caru h.t.; Douglas-fir/pinegrass)

The Psme/Caru h.t. occurs throughout much of the study area but is notably absent from southern portions of the Lemhi and Beaverhead Ranges and the Wind River Range (Fig. 11). It usually occurs in the mid to lower elevations of the forested zone on upper slopes and ridges. It occupies various cool dry aspects having gentle to moderate relief.

Pinus contorta may dominate seral stands and P. flexilis may appear in small amounts. Otherwise Pseudotsuga is the only conifer adapted to the site. Undergrowths vary between the phases listed below.

Pachistima myrsinites phase (Psme/Caru h.t., Pamy phase)

This minor phase occurs in southeastern Idaho and adjacent Wyoming (Fig. 11). A layer of Pachistima overtops the Calamagrostis and creates a characteristic feature of this phase. Berberis repens, Prunus virginiana and Symphoricarpos oreophilus are usually present. This phase appeared mainly on calcareous substrates.

Calamagrostis rubescens phase (Psme/Caru h.t., Caru phase)

This is the common phase of the Psme/Caru h.t. Here, a low dense layer of Calamagrostis usually dominates the undergrowth. Shrubs and forbs are normally sparse in old undisturbed stands. In some areas Symphoricarpos oreophilus is well represented. On some sites this may represent rocky slopes with inherently low tree stockability but in other areas the Symphoricarpos merely invades following disturbance.

Timber productivity ranges from low to moderate in this h.t. (Appendix C-3) and may vary geographically. Forage production will vary inversely with amount of overstory. When the overstory is reduced, Calamagrostis can rapidly develop a thick sod that often requires special treatment for successful conifer regeneration. When Pinus contorta is present it can be regenerated in openings that receive full sunlight if the site receives adequate site preparation and protection from grazing animals. When Pseudotsuga is the only conifer adapted to the site, the seedlings often require protection from wind and sun. In some areas following fire, Ceanothus velutinus sprouts from seed stored in the soil and may form a dominant layer for several decades.

The Psme/Caru h.t. was previously described in our area by Cooper (1975) and Henderson and others (1976). It was also noted in adjacent areas of Montana (Pfister and others, 1977) and central Idaho (Steele and others, 1975).

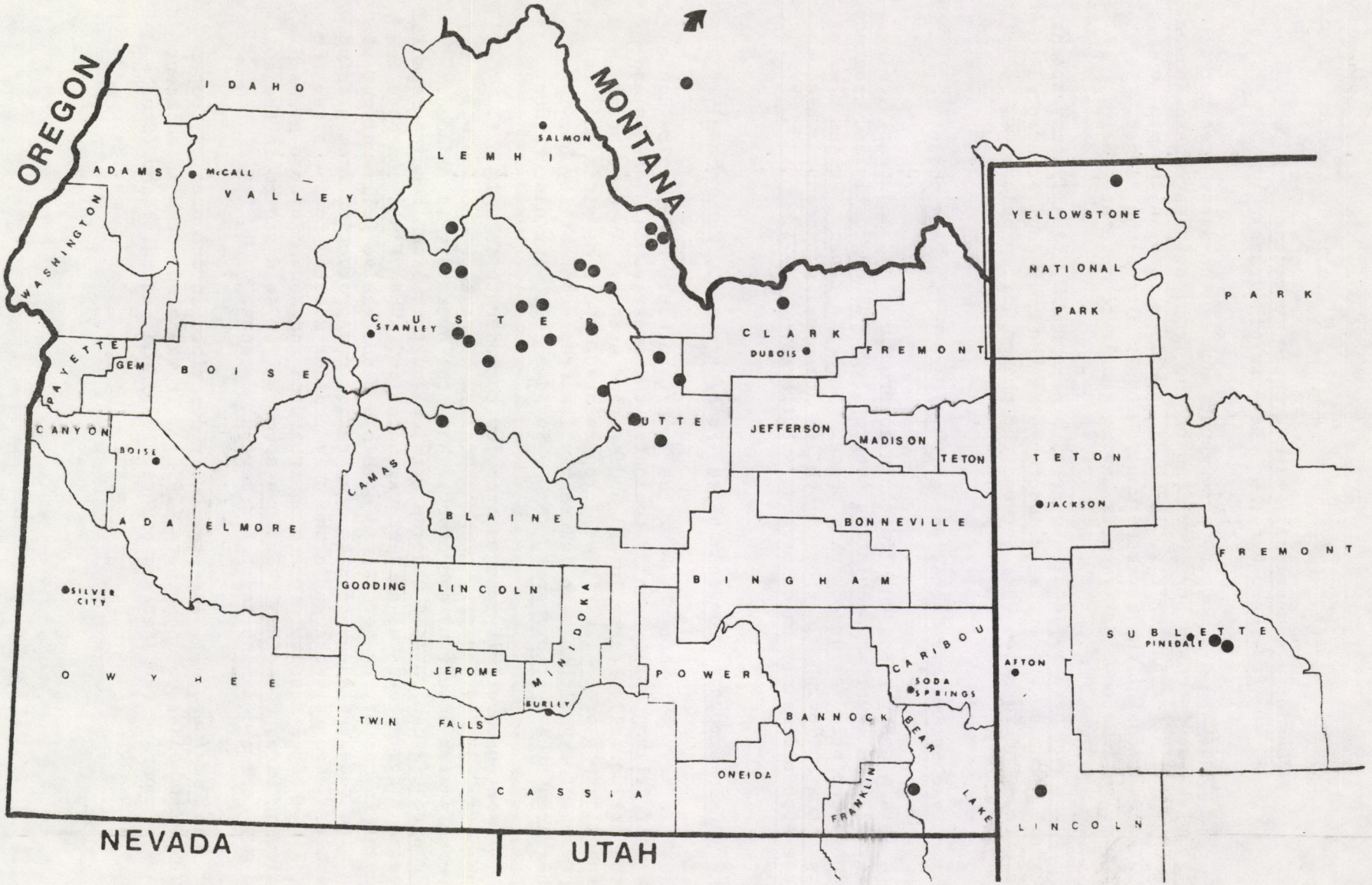


Fig. 12. Known locations of the Pseudotsuga menziesii/Juniperus communis h.t.

Pseudotsuga menziesii/Juniperus communis h.t. (*Psme/Juco* h.t.; Douglas-fir/common juniper)

The *Psme/Juco* h.t. exists mainly in east central Idaho and adjacent Montana (Fig. 12). It also appears in the Wind River Mountains and occasionally elsewhere in minor amounts. It normally occupies exposed rocky slopes at mid to lower elevations of the forested zone.

Pinus flexilis and occasionally *P. contorta* are common seral species but they seldom dominate the site. *Juniperus communis* usually forms large patches in the undergrowth. *Symphoricarpos oreophilus* is normally present and *Sheperdia canadensis* often occurs in younger stands. *Arnica cordifolia* usually dominates a depauperate forb layer.

Timber productivity potential is low (Appendix C-3). When present, *Pinus contorta* may be near its warm, dry limits and may not respond well to management. Regeneration of *Pseudotsuga* can be sporadic and any timber harvest should be guided by the patterns of regeneration observed in the stand. Most of these sites have little potential for livestock but often receive summer use by big game.

The *Psme/Juco* h.t. was previously described in east central Idaho (Steele and others, 1975) and in Montana (Pfister and others, 1977). It has not been noted in other studies.

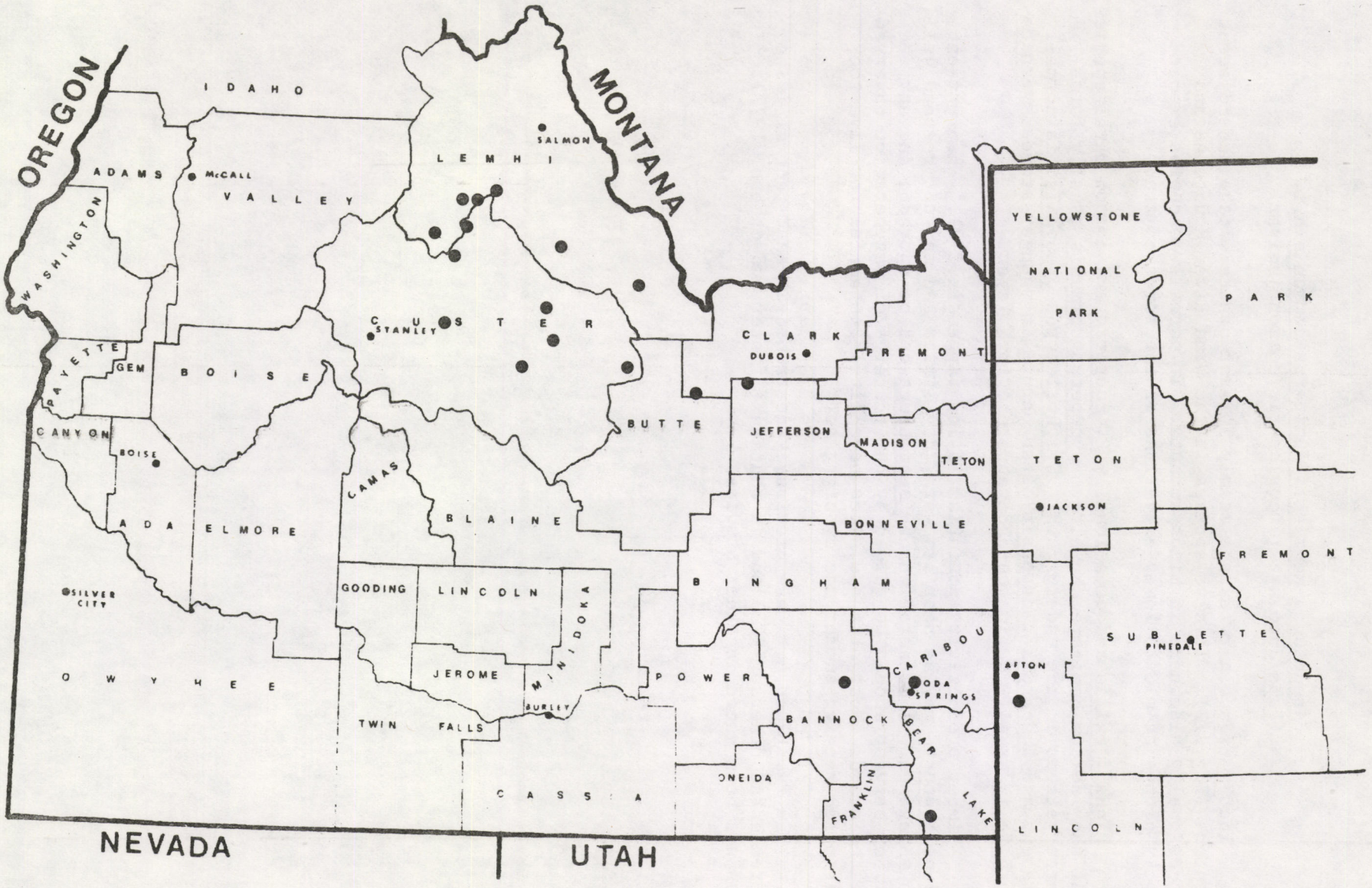


Fig. 13. Known locations of the Pseudotsuga menziesii/Cercocarpus ledifolius h.t.

Pseudotsuga menziesii/Cercocarpus ledifolius h.t. (Psme/Cele h.t.; Douglas-fir/mountain mahogany)

The Psme/Cele h.t. occurs in east central Idaho and extends southward into southeastern Idaho and adjacent Wyoming (Fig. 13). It appears on various aspects at lower timberline where it often borders a Cercocarpus shrub community. Most sites have calcareous substrates.

Trees are often widely scattered. Pseudotsuga is usually the only tree present but small amounts of Pinus flexilis may occur. A dense layer of Cercocarpus dominates the tree interspaces. Either Symphoricarpos oreophilus or Agropyron spicatum may form a subordinate layer.

Timber productivity potential is low to very low (Appendix C-3), due to low basal areas and low site index (Appendix C-3). Tree regeneration is very sporadic. Domestic livestock find sparse forage here which may be due to the dense layer of Cercocarpus. In many areas, the Cercocarpus provides important food and cover for big game.

The Psme/Cele h.t. was previously recorded in southeastern Idaho (Henderson and others, 1976) and in central Idaho (Steele and others, 1975). It has not been described elsewhere.

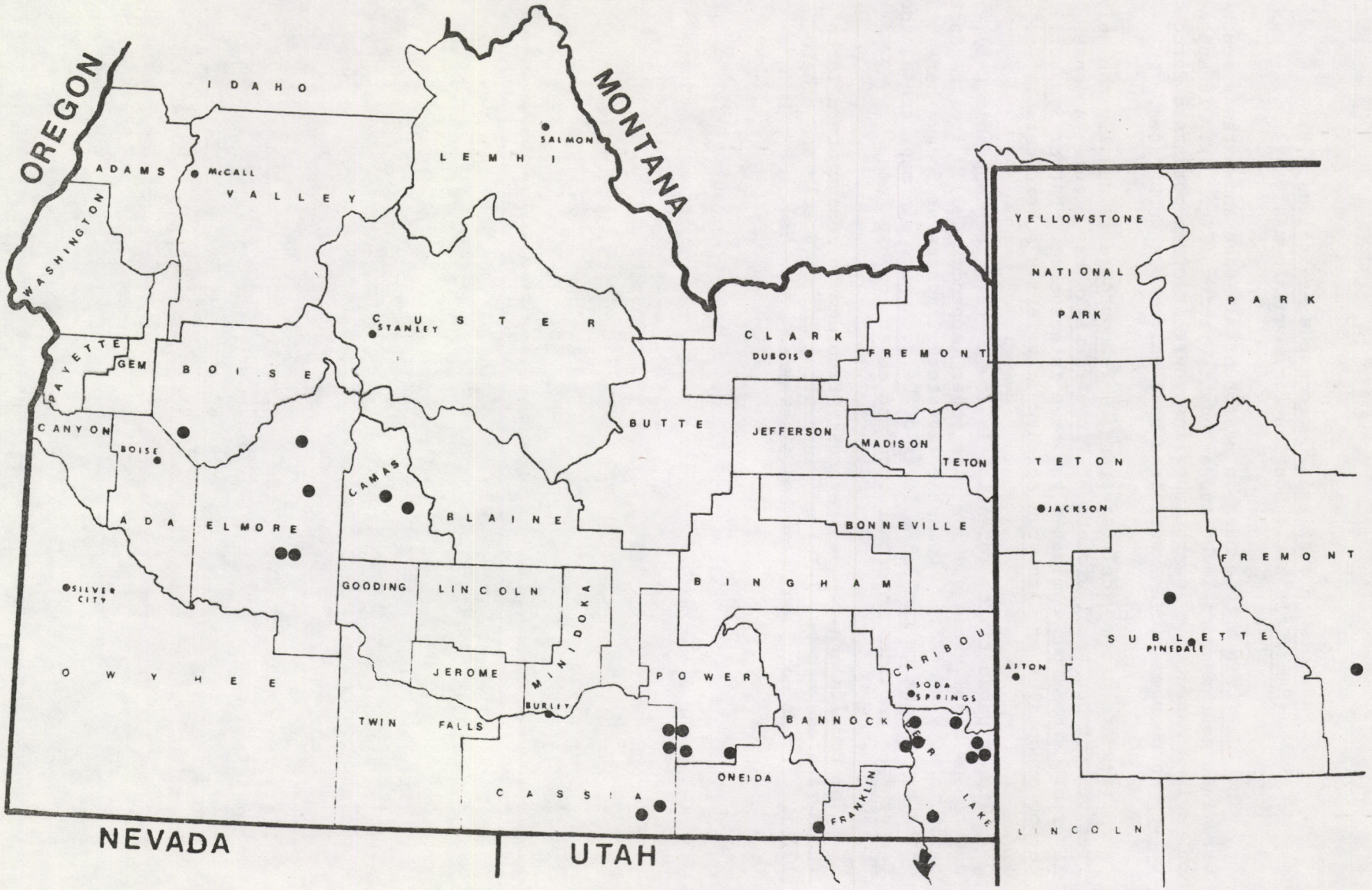


Fig. 14. Known locations of the Pseudotsuga menziesii/Berberis repens h.t.

Pseudotsuga menziesii/*Berberis repens* h.t.
(*Psme*/*Bere* h.t.; Douglas-fir/Oregongrape)

This h.t. occurs mainly in southeastern Idaho and adjacent Utah. It also occurs in extreme south central Idaho and appears sporadically in the Wind River Mountains of Wyoming (Fig. 14). It occupies a variety of aspects at mid to lower elevations of the forested zone.

Usually *Pseudotsuga* is the only tree present. *Berberis repens* and, in some areas, *Pachistima myrsinites* form a conspicuous layer in old-growth stands. *Prunus virginiana* and *Symphoricarpos oreophilus* often dominate the undergrowth of seral stands. *Smilacina racemosa* and *Arnica cordifolia* are the most common forbs. Adjacent drier sites generally support the *Psme*/*Syor* h.t. or nonforested communities.

Timber productivity appears moderate to high in this h.t. (Appendix C-3) but seedlings may require some protection from wind and sun. Cattle may use these sites for rest and shelter, especially when grazing areas are nearby. Only light use by big game was noted in this h.t.

This h.t. has been previously described in the southern Sawtooth National Forest (Steele and others, 1974) and in northwestern Utah and adjacent Idaho (Henderson and others, 1976).

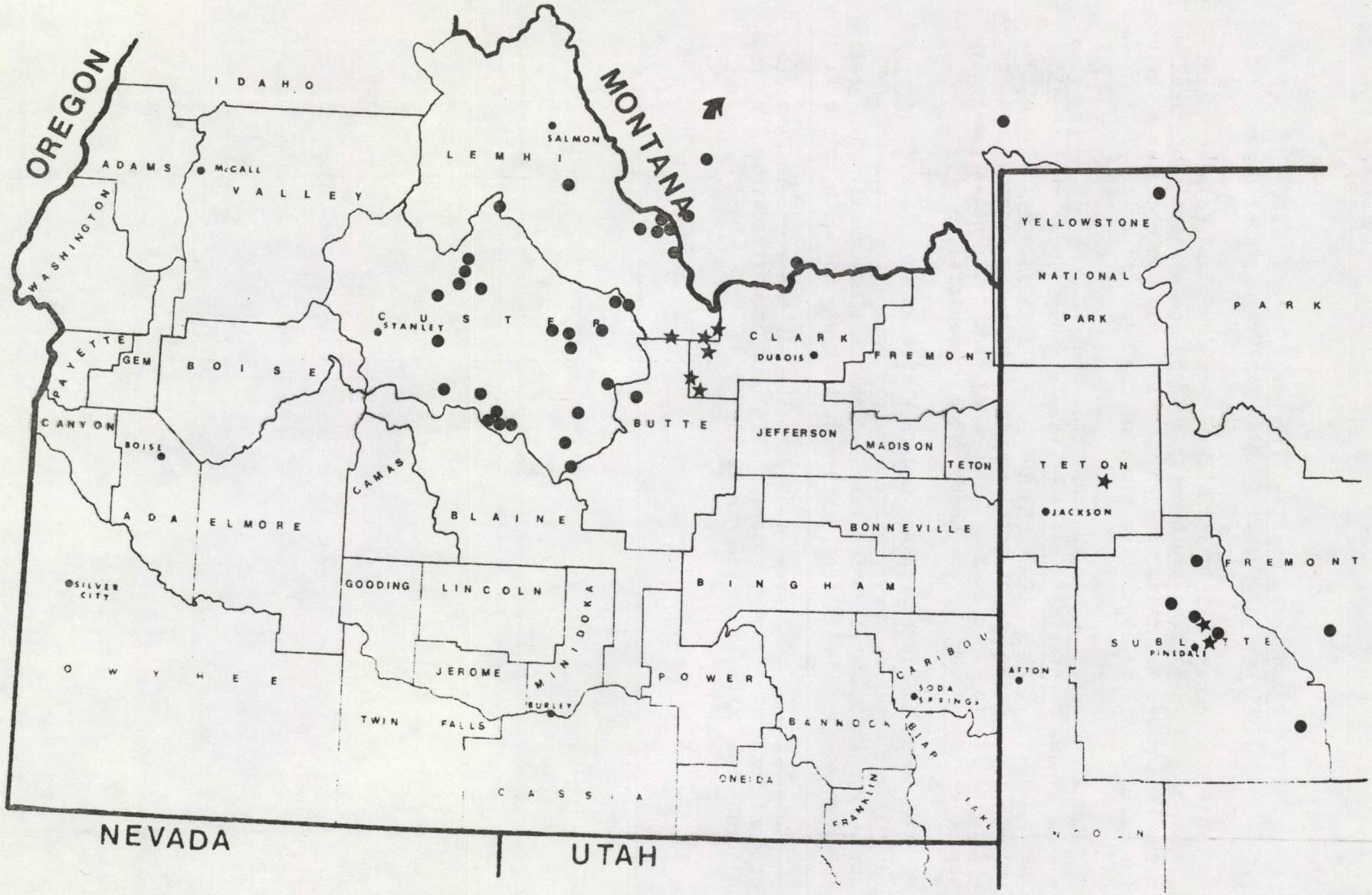


Fig. 15. Known locations of the Pseudotsuga menziesii/Arnica cordifolia h.t., Astragalus miser phase (★); Arnica cordifolia phase (●).

Pseudotsuga menziesii/Arnica cordifolia h.t. (Psme/Arco h.t.; Douglas-fir/heartleaf arnica)

The Psme/Arco h.t. exists mainly in east central Idaho and adjacent Montana and in the Wind River Mountains of Wyoming (Fig. 15). It occupies a variety of dry aspects at lower elevations of the forested zone.

Usually Pseudotsuga is the only tree present but Pinus contorta may appear on some sites. Symphoricarpos oreophilus, Poa nervosa and Festuca idahoensis are common members of a generally depauperate undergrowth. Arnica cordifolia or Astragalus miser are the dominant forbs and indicate phasal differences as noted below.

Astragalus miser phase (Psme/Arco h.t., Asmi phase)

This phase occurs in southern portions of the Lemhi and Beaverhead Mountains and locally in the Wind River Mountains (Fig. 15). Small amounts of Pinus flexilis appear more often in this phase than in the Arco phase and tree growth potential is somewhat less. Astragalus miser dominates a forb layer that is usually even more depauperate than in the Arco phase. The mosses, Hypnum revolutum, Dicranoweisia crispula, and Tortula ruralis, frequently appear in this phase. Occasionally the Hypnum or Tortula has a notably high coverage.

Arnica cordifolia phase (Psme/Arco h.t., Arco phase)

This is the more common phase within the h.t. Arnica cordifolia usually dominates a depauperate undergrowth. Sometimes Astragalus miser will codominate with the Arnica and may denote areas that are transitional to the Asmi phase. The most common mosses in this phase include Brachythecium collinum, Dicranoweisia crispula, and Tortula ruralis (Steele, 1974).

These sites may appear overstocked, especially in the Arco phase, but tree growth potential is low to moderate (Appendix C-3). Patterns of annual growth increment in both phases suggest that the period of maximum yield is extremely short, thus stand improvements may yield little return. Reproduction is often sporadic and may provide the best guidelines for frequency and pattern of timber harvest. Seral stands provide some forage for domestic livestock but animals attracted to these sites can further impede tree reproduction. More mature stands offer little forage but provide shelter for animals that feed in nearby grasslands. In some areas these stands also provide important cover for big game.

The Psme/Arco h.t. was previously described in central Idaho (Steele and others, 1975) and Montana (Pfister and others, 1977).

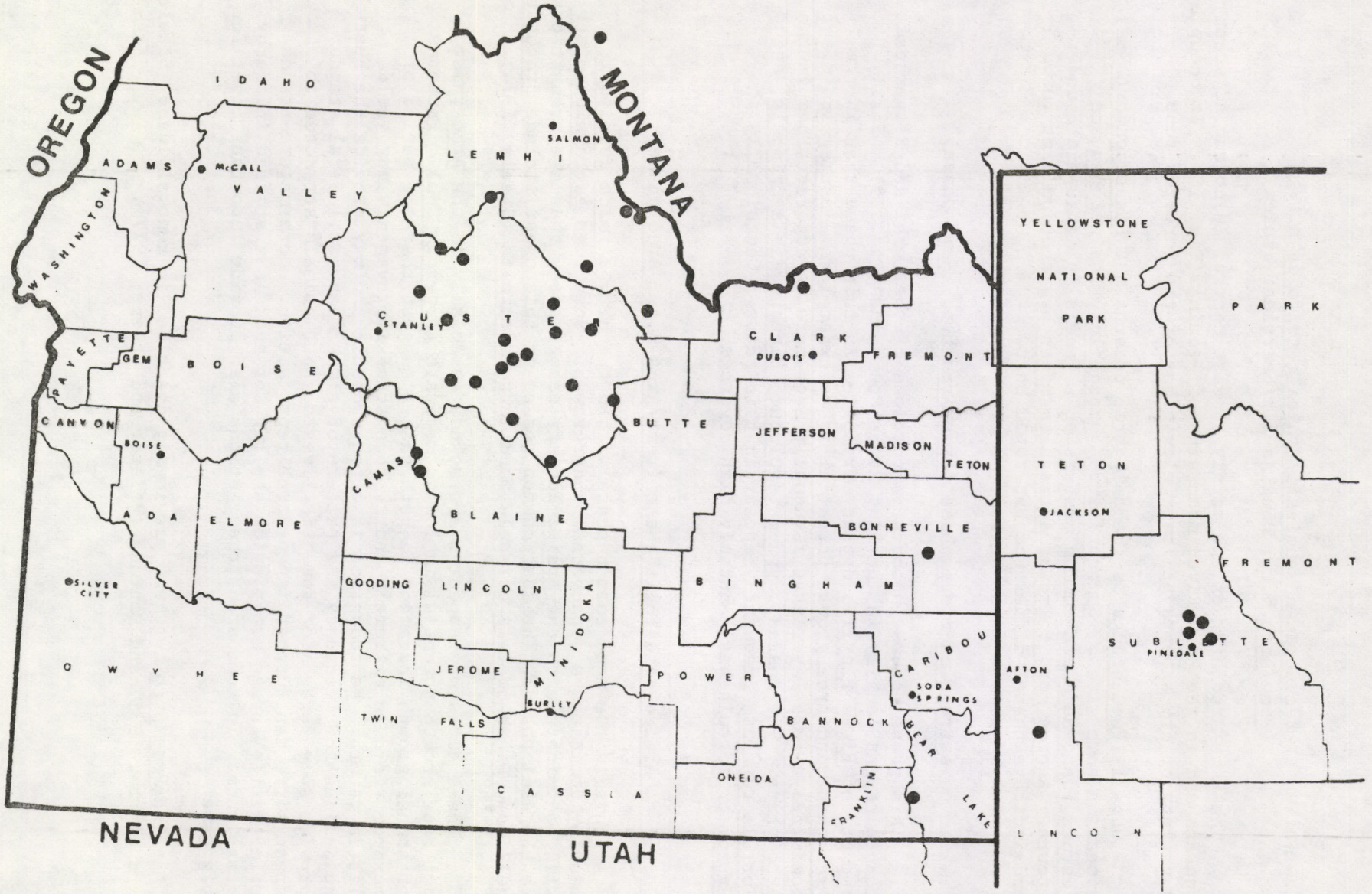


Fig. 16. Known locations of the Pseudotsuga menziesii/Symphoricarpos oreophilus h.t.

Pseudotsuga menziesii/Symphoricarpos oreophilus h.t. (Psme/Syor h.t., Douglas-fir/mountain snowberry)

The Psme/Syor h.t. occurs mainly in east central Idaho and the Wind River Mountains of Wyoming (Fig. 16). It typically represents a lower timberline condition and appears mostly where lower timberline occurs at relatively high elevations such as 7,000 to 8,000 feet. It can occur on a variety of slopes and aspects but southerly aspects are most common.

Occasionally P. flexilis or P. contorta may appear in small amounts but usually Pseudotsuga is the only tree on the site. The trees are usually widely spaced. Symphoricarpos oreophilus normally dominates a shrub layer that includes Artemisia tridentata and Ribes cereum. Generally forbs are sparse and Agropyron spicatum dominates the shrub interspaces. Adjacent drier sites are usually steppe or mountain shrub communities dominated by Symphoricarpos oreophilus and Artemisia tridentata. The Psme/Arco h.t. is most common on adjacent moister sites.

Timber productivity is low (Appendix C-3) and trees regenerate very sporadically in this h.t. Success at artificial regeneration is likely to be very low. The abundant shrubs and grasses attract both wild and domestic herbivores and the trees provide some shelter for animals that use adjacent rangelands.

The Psme/Syor h.t. was previously described in central Idaho (Steele and others, 1975) and its presence is noted in Montana (Pfister and others, 1977). Reed (1969) described a Psme/Syor h.t. in Wyoming that was much broader and included our Psme/Arco h.t. and a small amount of the Psme/Bere h.t.

E. PICEA ENGELMANNII SERIES

Throughout the study area are sites where Picea engelmannii appears to be the climax dominant. However, climax Picea does not appear to delineate a single zone like the other climax tree species. Instead, three environmental conditions are evident.

In some areas Picea apparently exceeds the warm limits of Abies lasiocarpa by extending down moist slopes and drainage ways. This situation is common in the Lemhi and Beaverhead Mountains and also appears in the Wind River Mountains. It becomes more prevalent in Montana where Picea displays an infusion of Picea glauca genes in the population (Pfister and others, 1977; Olgivie, 1962). In our area, evidence of Picea glauca traits are scarce and were observed mainly in the northeast corner of Yellowstone National Park (Cooper, 1975).

In the Wind River Mountains, Picea extends to higher elevations than Abies lasiocarpa, apparently exceeding the Abies cold limits. This condition also occurs in Utah where Picea is climax on gentle plateaus at high elevations (Pfister, 1972).

Throughout the study area, Picea may appear as a climax dominant on very wet sites at various elevations. Here Abies lasiocarpa is often present but usually only as a few unthrifty seedlings or an occasional sapling. These sites are usually topedaphic conditions that appear too wet for Abies lasiocarpa.

In Wyoming, Picea pungens occurs sporadically on various wet sites near or below the lower limits of Abies lasiocarpa. It may occur in pure stands or codominate with P. engelmannii. In either case, the undergrowths resemble those beneath pure P. engelmannii and have been included within this series. As more data on P. pungens communities are collected a separate P. pungens series should become evident.

Picea habitat types vary considerably in timber productivity but include some of the more productive sites in the area. Those occurring at moderate elevations may receive heavy winter use by big game and those along streams may be used heavily by recreationists.

Key to *Picea Engelmannii* Habitat Types

1. *Equisetum arvense* abundant.
   PICEA ENGELMANNII/EQUISETUM ARVENSE H.T. (p.53)

1. *E. arvense* not abundant 2

   2. *Carex disperma* well represented.
      PICEA ENGELMANNII/CAREX DISPERMA H.T. (p.51)

   2. *C. disperma* poorly represented 3

      3. *Galium triflorum*, *Actaea rubra* or *Streptopus amplexifolius* common.
         PICEA ENGELMANNII/GALIUM TRIFLORUM H.T. (p.55)

      3. Not as above 4

         4. *Linnaea borealis* common.
            PICEA ENGELMANNII/LINNAEA BOREALIS H.T. (p.51)

         4. *L. borealis* scarce 5

            5. *Vaccinium scoparium* well represented.
               PICEA ENGELMANNII/VACCINIUM SCOPARIUM H.T. (p.57)

            5. *V scoparium* poorly represented 6

               6. *Hypnum revolutum* (a prostrate moss) well represented.
                  PICEA ENGELMANNII/HYPNUM REVOLUTUM H.T. (p.59)

               6. *H. revolutum* poorly represented, *Ribes montigenum* present.
                  PICEA ENGELMANNII/RIBES MONTIGENUM H.T. (p.61)

Incidental Habitat Types in the *Picea engelmannii* Series

Picea engelmannii/Carex disperma h.t. (*Pien/Cadi*; spruce/soft leaved sedge)

This minor h.t. occurs mainly in east central Idaho and extends eastward into the Centennial Mountains. One stand was also found in the Wind River Mountains with *Picea pungens* as the climax dominant. Normally this h.t. occupies stream terraces near the lower limits of *Abies lasiocarpa* and often has a few *Abies* in the stand. Undisturbed sites are covered with a carpet of *Carex disperma*. Seral stands may contain *Pinus contorta* and numerous wet site herbs, graminoids, and shrubs. Steele and others (1975) further describe this h.t. for central Idaho.

Picea engelmannii/Linnaea borealis h.t. (*Pien/Libo* h.t.; spruce/twinflower)

This h.t. was found in small amounts in the Wind River Range and in Yellowstone Park. It becomes more common northward into central Montana. It appears mostly on well drained benches and alluvial terraces. *Pinus contorta* followed by *Pseudotsuga* dominate seral stands. *Linnaea borealis* characterizes the undergrowth but may be overtopped by various shrubs or herbs. Pfister and others (1977) further describe this h.t. for Montana and Cooper (1975) describes it in Yellowstone Park. In the Bighorn Mountains, Hoffman and Alexander (1976) show one stand ascribable to this h.t.

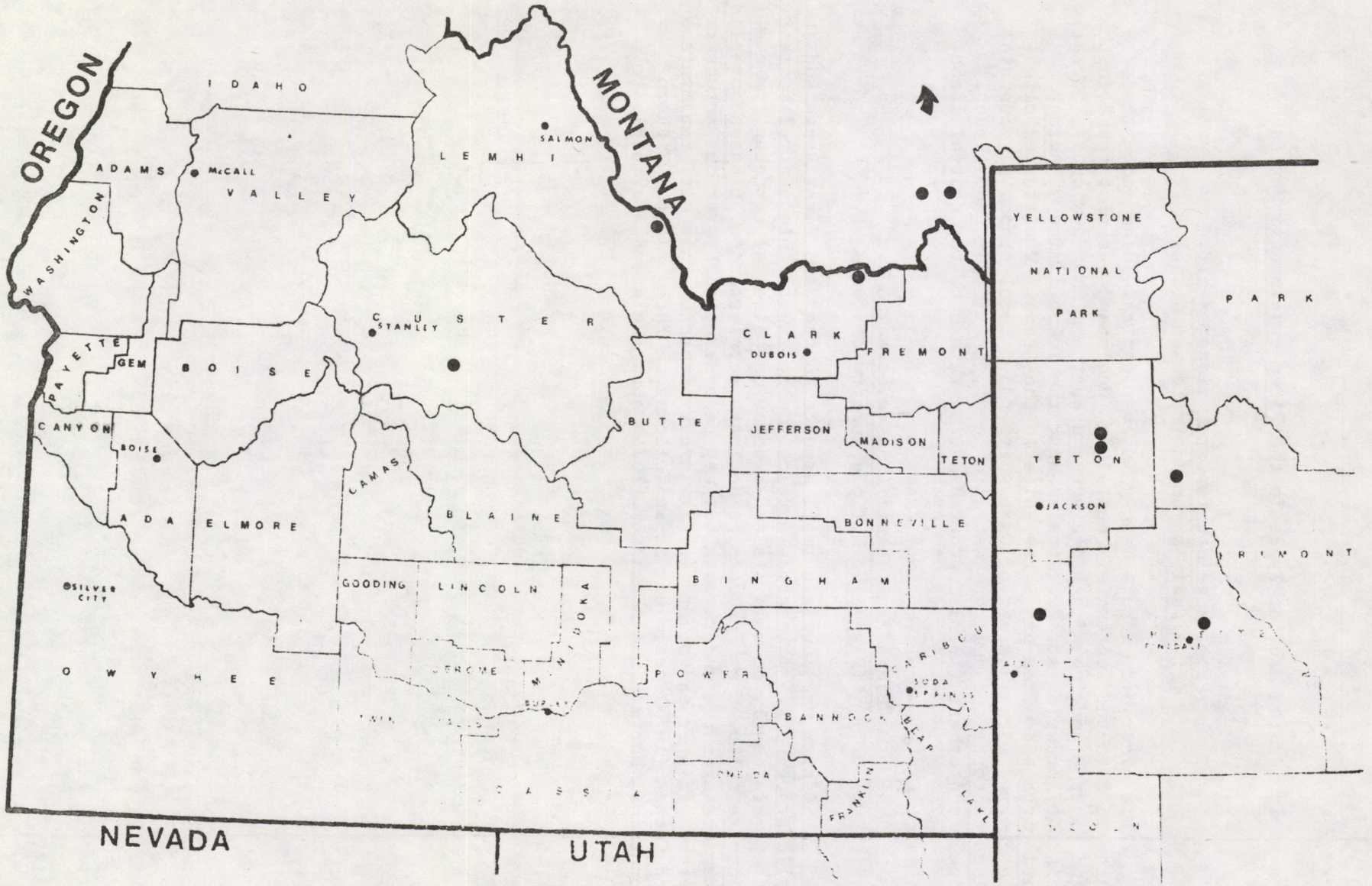


Fig. 17. Known locations of the Picea engelmannii/Equisetum arvense h.t.

Picea engelmannii/*Equisetum arvense* h.t.
(*Pien*/*Eqar* h.t.; spruce/common horsetail)

In the study area this h.t. occurs sporadically from the Greys River northward into Montana and east central Idaho (Fig. 17). It also appears in the Wind River Mountains where one stand contained *Picea pungens* as the climax dominant. These sites usually occur on stream terraces and very wet benches, rarely do they occur on sloping seeps. In all cases they occupy limited acreage.

Usually *Picea engelmannii* is the dominant tree on these sites. *Pinus contorta* may be present in seral stands and sometimes *Abies lasiocarpa* is present in minor amounts. *Equisetum arvense* usually dominates a rich undergrowth of wet site forbs and graminoids. A wide assortment of subalpine species may appear on the raised microsites provided by hummocks and tree bases. Mosses often form a notable layer in this h.t. The most common species are *Aulocomnium palustre*, *Timmia austriaca*, *Plagiomnium rugicum* and *Brachythecium rivulare*.

Timber productivity potential is moderate to high (Appendix C-3). *Picea* may grow well on these sites but timber harvest is limited by the easily destroyed substrates and windthrow potential of existing trees. Big game seek the lush forbs on these sites and may use the area for wallows. Domestic stock will graze here as other sites become dryer in late summer, but their concentrated use can easily destroy the plant cover.

Cooper (1975) previously described this h.t. in part of the study area and Pfister and others (1977) describe it in Montana.

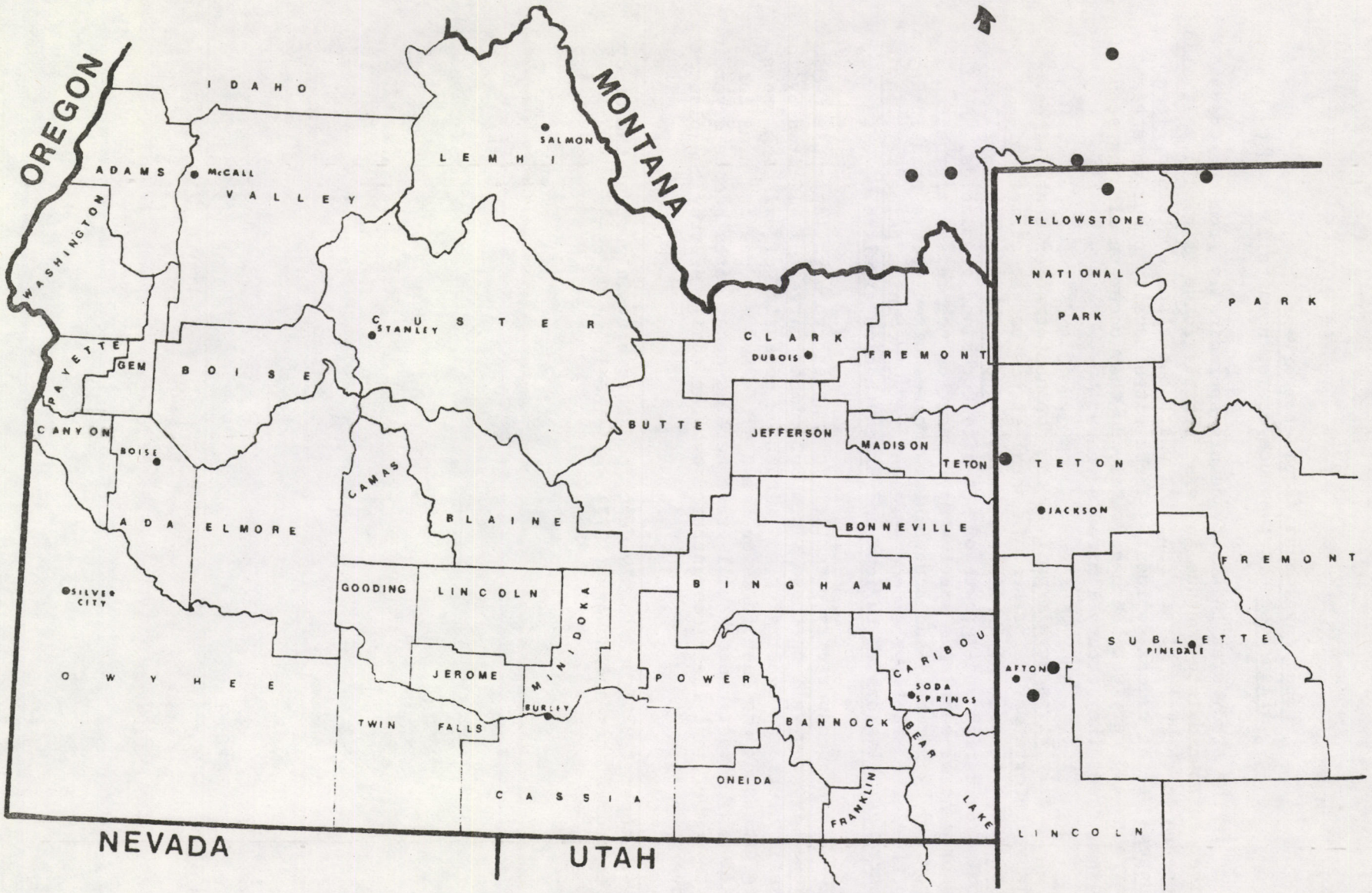


Fig. 18. Known locations of the Picea engelmannii/Galium triflorum h.t.

Picea engelmannii/Galium triflorum h.t.
(*Pien/Gatr* h.t.; spruce/sweetscented bedstraw)

This h.t. occurs mainly in south central Montana and extends southward into western Wyoming (Fig. 18). Areas too small to sample were also observed in the Wind River Mountains. Typically, these sites occur on alluvial terraces or bottomlands. Occasionally they appear on slopes associated with seeps.

Normally *Picea engelmannii* dominates the stand but in the Wind River Mountains and along the Greys River, *P. pungens* was sometimes a dominant or codominant. Occasionally *Abies lasiocarpa* may achieve a minor foothold and small amounts of *Pinus contorta* may invade following disturbance. Undergrowths vary considerably as a reflection of site history and adjacent plant communities. However, *Galium triflorum*, *Actaea rubra*, and *Smilacina stellata* are common throughout the type and *Streptopus amplexifolius* and *Senecio triangularis* occur in wetter portions of the type.

Timber productivity potential was moderate to high (in the few stands we sampled (Appendix C-3). *Picea* and sometimes *Pinus contorta* grow well in this h.t., but the streamside locations may restrict timber harvest. Machinery and livestock can easily disrupt the soils and expose high water tables which may be present on these sites. Protection of soil and water resources may outweigh the other values present.

Cooper (1975) previously described this h.t. in part of the study area as the *Picea-Abies lasiocarpa/Galium triflorum* h.t. In Montana, Pfister and others (1977) also describe a similar condition as the *Picea/ Galium triflorum* h.t. In our area *Actaea rubra* serves as the most characteristic indicator of the site but we have retained the *Galium* epithet to avoid confusion.

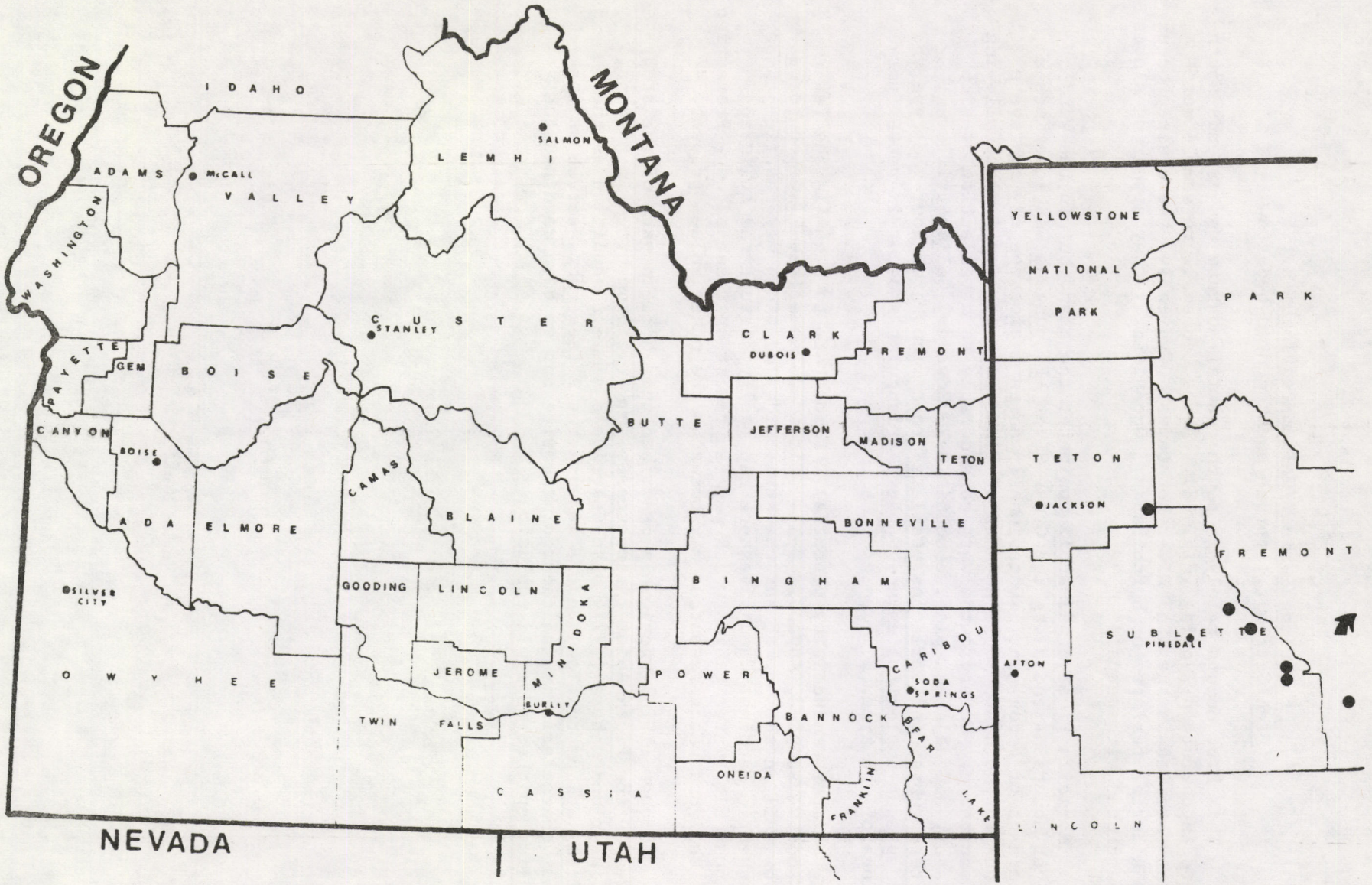


Fig. 19. Known locations of the Picea engelmannii/Vaccinium scoparium h.t.

Picea engelmannii/*Vaccinium scoparium* h.t.
(*Pien*/*Vasc* h.t., spruce/grouse whortleberry)

In the study area, this h.t. was found only in the Wind River Mountains but it also appears in the Bighorn Mountains to the northeast (Fig. 19). It is most common on gentle terrain at upper elevations of the forest zone.

In old growth stands, *Picea engelmannii* dominates a layer of *Vaccinium scoparium*. Occasionally *Abies lasiocarpa* is present in small amounts but demonstrates little potential for increasing its foothold. *Pinus contorta* persists as a seral dominant on these sites. Forbs are sparse but usually include *Arnica cordifolia*, *Antennaria microphylla*, and *Lupinus*.

Pinus contorta should regenerate well in openings but productivity potential is only moderate (Appendix C-3). The cones are mainly nonserotinous. Regeneration of *Picea* is favored by protection from sun and wind. Domestic livestock find little forage here but elk and moose use these sites during the summer.

Reed (1969) originally described this h.t. in the Wind River Mountains but included sites with successful *Abies lasiocarpa*. We prefer to classify those sites as part of the *Abla*/*Vasc* h.t. In the Bighorn Mountains, Hoffman and Alexander (1976) described a similar h.t., part of which occurs at somewhat lower elevations and contains *Berberis* and *Spiraea*. These sites appear to be a warmer variant of the above description.

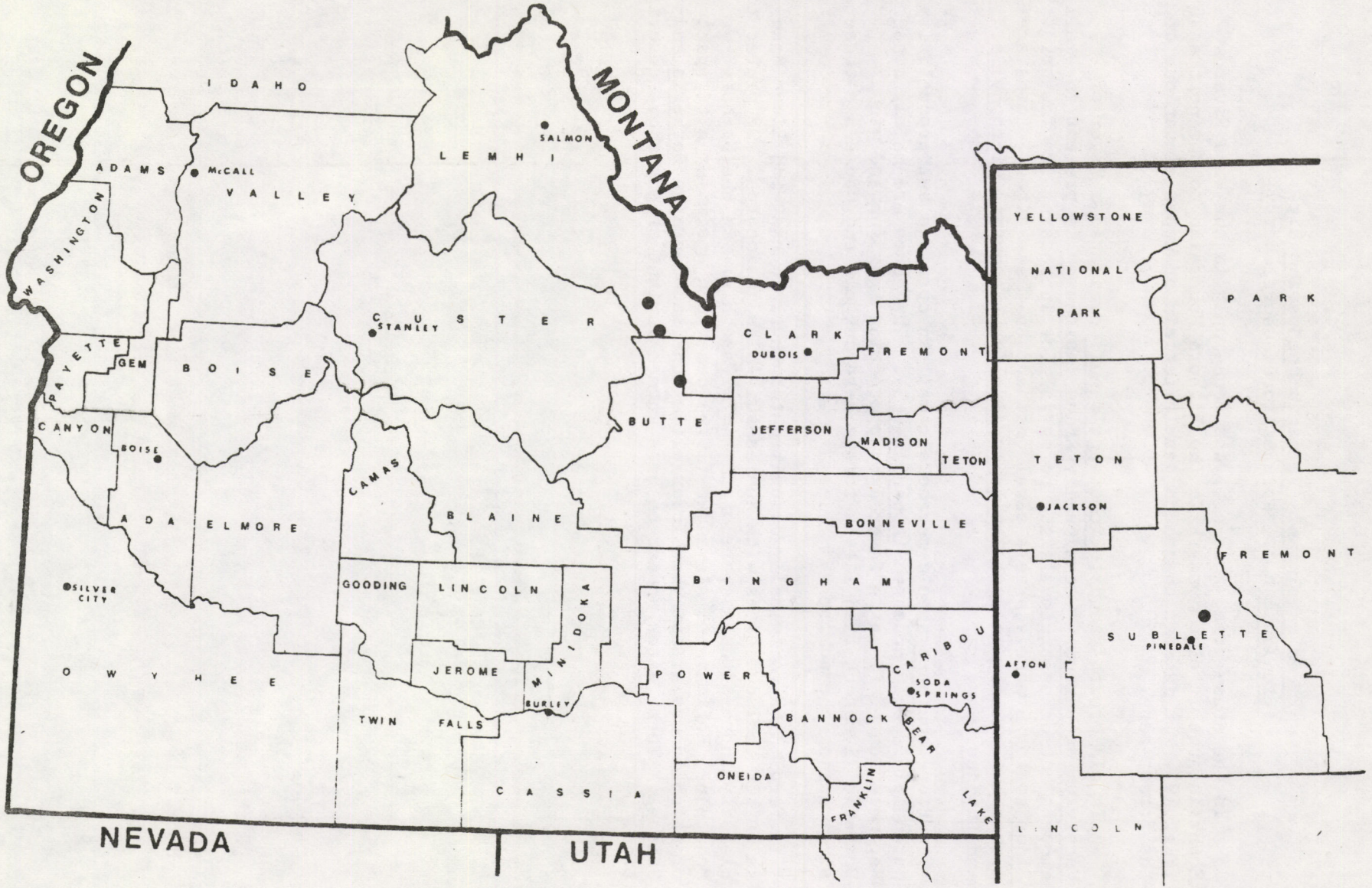


Fig. 20. Known locations of the Picea engelmannii/Hypnum revolutum h.t.

Picea englemannii/*Hypnum revolutum* h.t.
(*Pien*/*Hyre* h.t.; spruce/hypnum)

This h.t. is essentially endemic to the southern half of the Lemhi and Beaverhead Ranges (Fig. 20). However, stands weakly representing this h.t. occasionally appear in the Wind River Range. In all cases, these sites occur on steep northerly aspects where snow apparently accumulates in winter and persists in the spring. Though well drained and relatively very dry, these are usually the most mesic upland sites in the area.

Pseudotsuga predominates in most stands with lesser amounts of *Picea* occurring throughout. In old growth stands, regeneration of the two trees is often equal. *Pinus flexilis* is normally present in small amounts. Shrubs and forbs are notably sparse and, if present, usually include *Symphoricarpos oreophilus*, *Sheperdia canadensis*, and *Arnica cordifolia*. Unless disturbed, a thin layer of moss, *Hypnum revolutum*, dominates the undergrowth. Other mosses may be scarce but *Dicranowiesia crispula* is usually present on rotting wood. The foliose lichen, *Peltigera rufescens* is usually evident throughout the stand and *Cladonia fimbriata* is usually present on rotting wood.

Timber productivity potential is low (Appendix C-3). Growth rates of *Pseudotsuga* and especially *Picea* are slow and diameter increments decline rapidly at a relatively early age. Consequently, expected gains from stand improvement may be marginal. Tree regeneration may be sporadic and timber harvests should remove trees according to the pattern and frequency of regeneration observed in the stand. Big game find very little forage on these sites but may use the area for cover and escape.

This h.t. has not been described elsewhere.

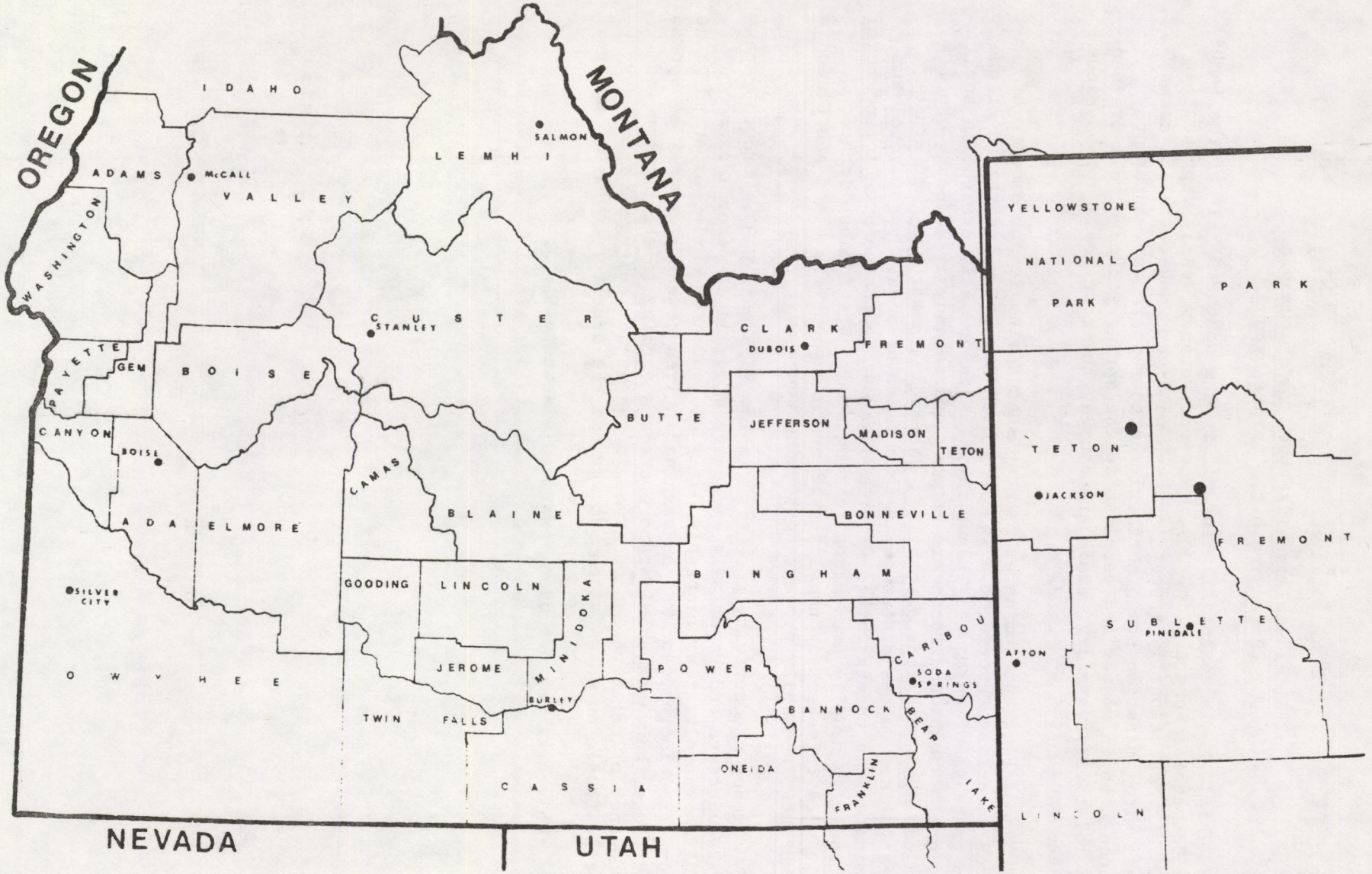


Fig. 21. Known locations of the Picea engelmannii/Ribes montigenum h.t.

Picea engelmannii/*Ribes montigenum* h.t.
(*Pien*/*Rimo* h.t.; spruce/mountain gooseberry)

This minor h.t. was found on gentle rolling plateaus along the crest of the Wind River Range (Fig. 21). These patches of timber are interspersed by grassy meadows and seasonal wetlands. Elevations usually exceed 9,000 feet.

Picea may be the only tree on the site but more often is replacing *Pinus contorta* or *P. albicaulis*. Rarely, *Abies lasiocarpa* is present as an unthrifty seedling or sapling. Undergrowths are depauperate but usually include *Ribes montigenum*, *Arnica cordifolia* and *Lupinus*. The *Ribes* is usually the principal shrub.

Where *Pinus contorta* is present it should regenerate wherever openings are made in the stand. Small openings will favor *Picea* but its seedlings may require some site protection. Big game and livestock will find little forage on these sites but may use them in conjunction with adjacent meadows.

In southern Utah, Pfister (1972) described a *Pien*/*Rimo* h.t. which because of its extreme geographic separation and floristic differences should be considered a variant of the above type. However, the sites and topographic position described by Pfister are remarkably similar to the above h.t.

F. ABIES LASIOCARPA SERIES

The Abies lasiocarpa series occupies more forested land in the study area than any other tree series. It is common everywhere except in southern portions of the Lemhi, Beaverhead and Wind River Mountains where Abies lasiocarpa is greatly restricted by droughty conditions. Nearly everywhere it borders the Pseudotsuga series at its lower limits. Near its upper limits it meets various alpine communities or grassy balds. In some areas Pinus albicaulis becomes increasingly prevalent toward the upper limits of this series and may form pure stands on the most severe exposures. On the crest of the Wind River Range the Abies lasiocarpa series gives way to pure Picea communities in some areas.

Pinus contorta is the major seral tree throughout most of this series. Its successional role varies, however, from a rapidly replaced species to one that reproduces and persists as a dominant for many years. Seral Pseudotsuga also occurs throughout most of the series but is a major dominant in only the warmer portions where Pinus contorta is less abundant. Picea engelmannii appears throughout the series and becomes codominant on increasingly wetter sites. Populus tremuloides commonly persists on the fringes of Abies lasiocarpa communities and as small unthrifty trees within the stand. In these situations the Populus may readily dominate disturbed sites by sprouting from existing root systems. Although field observation suggests a ubiquity of Populus, our data show little or no occurrence in h.t.s or phases dominated by Vaccinium scoparium.

In lower elevations, of the Abies lasiocarpa series, big game have had a significant impact on secondary succession in some areas. Overwintering moose have browsed young Abies lasiocarpa to the point that succession is retarded and some stands superficially appear as Pseudotsuga or Picea climax. Only close examination of these stands will reveal the Abies remnants in the undergrowth. In other stands many woody plants have been reduced by browsing. Here, the greatest impact has been on major seral species such as Amelanchier, Prunus, and Populus tremuloides. Reduction of only the seral species hastens succession toward climax with less suitable food available for big game.

Key to *Abies lasiocarpa* Habitat Types

1. *Equisetum arvense* abundant.
   PICEA ENGELMANNII/EQUISETUM ARVENSE H.T. (p.53)

1. *E. arvense* not abundant 2

   2. *Carex disperma* well represented.
      PICEA ENGELMANNII/CAREX DISPERMA H.T. (p.51)

   2. *C. disperma* poorly represented 3

      3. *Calamagrostis canadensis* or *Ledum glandulosum* well represented.
         ABIES LASIOCARPA/CALAMAGROSTIS CANADENSIS H.T. (p.67)
         a. *Ledum glandulosum* well represented.
            LEDUM GLANDULOSUM PHASE (p.67)
         b. Not as above in a; *Vaccinium caespitosum* common.
            VACCINIUM CAESPITOSUM PHASE (p.67)
         c. Not as above in a or b.
            CALAMAGROSTIS CANADENSIS PHASE (p.67)

      3. *C. canadensis* and *L. glandulosum* poorly represented 4

         4. *Streptopus amplexifolius* or *Senecio triangularis* well represented either individually or collectively.
            ABIES LASIOCARPA/STREPTOPUS AMPLEXIFOLIUS H.T. (p.67)

         4. Not as above 5

            5. *Menziesia ferruginea* well represented.
               ABIES LASIOCARPA/MENZIESIA FERRUGINEA H.T. (p.67)

            5. *M. ferruginea* poorly represented 6

               6. *Actaea rubra* common.
                  ABIES LASIOCARPA/ACTAEA RUBRA H.T. (p.71)

               6. *A. rubra* scarce 7

                  7. *Physocarpus malvaceus* well represented.
                     ABIES LASIOCARPA/PHYSOCARPUS MALVACEUS H.T. (p.73)

                  7. *P. malvaceus* poorly represented 8

                     8. *Acer glabrum* well represented.
                        ABIES LASIOCARPA/ACER GLABRUM H.T. (p.75)

                     8. *A. glabrum* poorly represented 9

9. Linnaea borealis common.
ABIES LASIOCARPA/LINNAEA BOREALIS H.T. (p.77)
a. Vaccinium scoparium well represented.
VACCINUM SCOPARIUM PHASE (p.77)
b. V. scoparium poorly represented.
LINNAEA BOREALIS PHASE (p.77)

9. L. borealis scarce 10

10. Xerophyllum tenax well represented.
ABIES LASIOCARPA/XEROPHYLLUM TENAX H.T. (p.68)

10. X. tenax poorly represented 11

11. Vaccinium globulare well represented.
ABIES LASIOCARPA/VACCINIUM GLOBULARE H.T. (p.79)
a. Vaccinium scoparium well represented.
VACCINIUM SCOPARIUM PHASE (p.79)
b. V. scoparium poorly represented.
PACHISTIMA MYRSINITES PHASE (p.79)

11. V. globulare poorly represented 12

12. Symphoricarpos albus well represented.
ABIES LASIOCARPA/SYMPHORICARPOS ALBUS H.T. (p.81)

12. S albus poorly represented 13

13. Thalictrum occidentale well represented.
ABIES LASIOCARPA/THALICTRUM OCCIDENTALE H.T. (p.83)

13. T. occidentale poorly represented 14

14. Spiraea betulifolia well represented.
ABIES LASIOCARPA/SPIRAEA BETULIFOLIA H.T. (p.85)

14. S. betulifolia poorly represented 15

15. Luzula hitchcockii common.
ABIES LASIOCARPA/LUZULA HITCHCOCKII H.T. (p.69)

15. L. hitchcockii scarce 16

16. Vaccinium scoparium well represented.
ABIES LASIOCARPA/VACCINIUM SCOPARIUM H.T. (p.87)
a. Calamagrostis rubescens well represented.
CALAMAGROSTIS RUBESCENS PHASE (p.87)
b. C. rubescens poorly represented; Pinus albicaulis well represented.
PINUS ALBICAULIS PHASE (p.87)
c. Not as above in a or b
VACCINIUM SCOPARIUM PHASE (p.87)

16. V. scoparium poorly represented. 17

17. Arnica latifolia well represented.
ABIES LASIOCARPA/ARNICA LATIFOLIA H.T. (p.89)

17. A. latifolia poorly represented 18

18. Osmorhiza chilensis or O. depauperata well represented either individually or collectively.
ABIES LASIOCARPA/OSMORHIZA CHILENSIS H.T. (p.91)
a. Pachistima myrsinites well represented.
PACHISTIMA MYRSINITES PHASE (p.91)
b. P. myrsinites poorly represented.
OSMORHIZA CHILENSIS PHASE (p.91)

18. O. chilensis and O. depauperata poorly represented 19

19. Calamagrostis rubescens well represented.
ABIES LASIOCARPA/CALAMAGROSTIS RUBESCENS H.T. (p.93)
a. Pachistima myrsinites well represented.
PACHISTIMA MYRSINITES PHASE (p.93)
b. P. myrsinites poorly represented.
CALAMAGROSTIS RUBESCENS PHASE (p.93)

19. C. rubescens poorly represented 20

20. Carex geyeri well represented.
ABIES LASIOCARPA/CAREX GEYERI H.T. (p.68)

20. C. geyeri poorly represented 21

21. Berberis repens common or Pachistima myrsinites well represented.
ABIES LASIOCARPA/BERBERIS REPENS H.T. (p.95)

21. B. repens scarce and P. myrsinites poorly represented 22

22. Juniperus communis well represented.
ABIES LASIOCARPA/JUNIPERUS COMMUNIS H.T. (p.69)

22. J. communis poorly represented 23

23. Ribes montigenum well represented or the dominant plant of normally depauperate undergrowths.
ABIES LASIOCARPA/RIBES MONTIGENUM H.T. (p.97)

23. Not as above 24

24. Pedicularis racemosa common.
ABIES LASIOCARPA/PEDICULARIS RACEMOSA H.T. (p.99)

24. P. racemosa scarce 25

25. Arnica cordifolia or Astragalus miser well represented or dominant; or Sheperdia canadensis well represented.
ABIES LASIOCARPA/ARNICA CORDIFOLIA H.T. (p.101)
a. Astragalus miser common.
ASTRAGALUS MISER PHASE (p.101)
b. A. miser scarce.
ARNICA CORDIFOLIA PHASE (p.101)

25. Not as above; Carex rossii well represented or dominant.
ABIES LASIOCARPA/CAREX ROSSII H.T. (p.68)

Incidental Habitat Types in the Abies lasiocarpa Series

Abies lasiocarpa/Calamagrostis canadensis h.t.
(Abla/Caca h.t.; subalpine fir/bluejoint)

The Abla/Caca h.t. was found mainly in Yellowstone Park and the adjacent Targhee National Forest. It usually appears along stream sides and pond margins and occasionally on other sites having high water tables. Picea engelmannii and Pinus contorta are the major seral conifers with Picea creating a more persistent stand. Undergrowths are usually dominated by Calamagrostis or Ledum, depending on the phase involved. Cooper (1975) has described this type within the study area. Steele and others; (1975) and Pfister and others, al. (1977) describe this h.t. more fully from other areas.

Abies lasiocarpa/Streptopus amplexifolius h.t.
(Abla/Stam h.t.; subalpine fir/twisted stalk)

This h.t. appeared sporadically along western flanks of the Teton Range and on the Teton National Forest. It normally occurs on moist slopes and alluvial terraces having high water tables. Picea engelmannii usually dominates as a persistent seral species. Pinus contorta occurs infrequently. Seral undergrowths appear as lush tall forb communities that usually include Senecio triangularis and Aconitum columbianum. As the tree canopy closes, these forbs decline and Streptopus becomes more apparent. Steele and others (1975) further describe this h.t. in central Idaho where it is more widespread.

Abies lasiocarpa/Menziesia ferruginea h.t.
(Abla/Mefe h.t.; subalpine fir/menziesia)

Small amounts of the Abla/Mefe h.t. occur on eastern slopes of the Teton Range (Cooper, 1975). It occupies moist ravines in the vicinity of Jenny, Leigh, and String Lakes and possibly elsewhere. Usually Picea engelmannii is the major seral dominant. Pinus contorta and Pseudotsuga may be present in minor amounts. Menziesia dominates the undergrowth and often forms a tall dense layer. The Abla/Mefe h.t. becomes more common in western Montana (Pfister and others, 1977) and central Idaho (Steele and others, 1975) where it is described more fully.

Abies lasiocarpa/Xerophyllum tenax h.t.
(Abla/Xete h.t.; subalpine fir/beargrass)

The Abla/Xete h.t. occurs locally in the Teton Range near the southern border of Yellowstone Park (Horton, 1971; Cooper, 1975). Pinus contorta is the common seral dominant and, in some areas, Picea and Pseudotsuga may appear in small numbers. Vaccinium scoparium and V. globulare appear in various amounts and may codominate with Xerophyllum. This h.t. is more common in Montana (Pfister and others, 1977) and central Idaho (Steele and others, 1975) where it is described in detail.

Abies lasiocarpa/Carex geyeri h.t.
(Abla/Cage h.t.; subalpine fir/elksedge)

The Abla/Cage h.t. typically occurs on the coarse granitic soils in central Idaho (Steele and others, 1975). Minor amounts also appear in Yellowstone Park and Teton National Forest (Cooper, 1975). It also occurs in Montana (Pfister and others, 1977) and in the Medicine Bow National Forest (Wirsing and Alexander, 1975). Pinus contorta is the most common seral tree and small amounts of Picea or Pseudotsuga are sometimes present. Usually Carex geyeri is dominant among a sparse layer of forbs. Shrubs are generally sparse with Ribes montigenum and Symphoricarpos oreophilus appearing most frequently. Stands of the Abla/Cage h.t. in the study area should resemble the description given for central Idaho (Steele and others, 1975).

Abies lasiocarpa/Carex rossii h.t.
(Abla/Caro h.t.; subalpine fir/Ross sedge)

This minor h.t. exists mainly in the southern Sawtooth National Forest and occasionally eastward to the Wasatch Range. It occupies gentle slopes and benches at mid elevations of the Abies lasiocarpa zone. Pinus contorta is the principal seral species on these sites. Other seral trees are very sparse. Carex rossii dominates a very depauperate undergrowth of forest forbs and Pyrola secunda may form small patches in the deepest shade. Details of this h.t. are outlined by Steele and others, (1974).

Abies lasiocarpa/Juniperus communis h.t.
(Abla/Juco h.t.; subalpine fir/common juniper)

The Abla/Juco h.t. occurs mainly in east central Idaho but small amounts also exist in the study area. It usually occurs at mid elevations of the Abies lasiocarpa zone but also follows cold air drainages into lower elevations where it appears on benches or dry stream terraces. Pinus contorta and Pseudotsuga are the major seral conifers and Picea is occasionally present. Patches of Juhiperus communis create the dominant aspect of the undergrowth and Arnica cordifolia is usually the dominant forb. In seral stands, Sheperdia canadensis may form a persistent layer. A more complete description of the Abla/Juco h.t. is available in Steele and others (1975).

Abies lasiocarpa/Luzula hitchcockii h.t.
(Abla/Luhi h.t.; subalpine fir/smooth woodrush)

Small pathces of the Abla/Luhi h.t. occur in the Teton Range (Cooper, 1975). It appears at the upper extremes of the Abies lasiocarpa zone where snow persists late into the growing season. Picea engelmannii, Pinus contorta and Pinus albicaulis are considered the major seral dominants but succession is so slow that Picea and Pinue albicaulis usually persist in the stand. Luzula hitchcockii may dominate the undergrowth or form a patchy layer beneath Vaccinium scoparium. This h.t. is more extensive in Montana (Pfister and others, 1977) and in central Idaho (Steele and others, 1975).

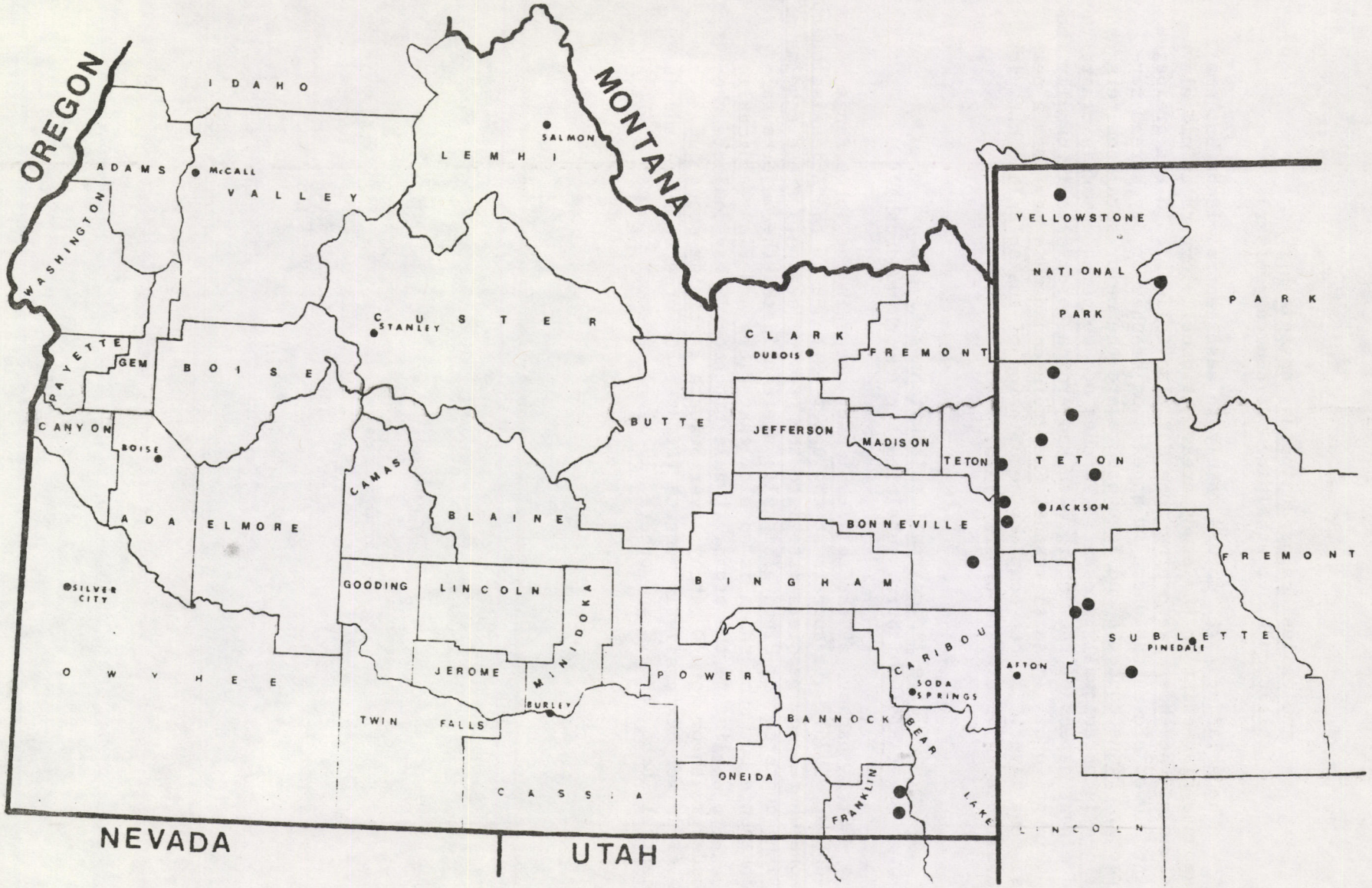


Fig. 22. Known locations of the Abies lasiocarpa/Actaea rubra h.t.

Abies lasiocarpa/Actaea rubra h.t.
(Abla/Acru h.t.; subalpine fir/baneberry)

This h.t. occurs mainly in mountains near the Idaho-Wyoming border from Yellowstone National Park south to Utah (Fig.). It usually appears on moist but well-drained alluvial terraces and lower slopes. Normally it occupies the mild mid to lower elevations of the Abies lasiocarpa zone.

Picea engelmannii is the major seral tree. Lesser amounts of Pinus contorta and sometimes Pseudotsuga may be present. Undergrowths vary somewhat but usually include Lonicera utahensis and Vaccinium globulare. Rubus parviflorus is often present on disturbed sites and Acer glabrum becomes prominent on sites south of Palisades Reservoir. Actaea rubra is the characteristic species in the undergrowth and usually forms small clumps throughout the h.t. Adjacent drier sites are usually Abla/Vagl or Abla/Acgl h.t. Wetter sites, if not riparian, are usually Abla/Stam or Pien/Eqar h.t.

Timber productivity potential is moderate to high (Appendix C-3). Picea regeneration appears to establish easily wherever the shrub layer is reduced. When present, Pinus contorta and Pseudotsuga may also be highly productive. Big game find considerable food and cover in the diverse assemblage of shrubs and forbs and the proximity to streams make these sites especially attractive to moose.

In Montana, Pfister and others, (1977) describe an Abies lasiocarpa/Galium triflorum h.t. which appears related to the Abla/Acru h.t. in some respects. Cooper (1975) described a few stands in the Teton Range as part of the Abla/Gatr h.t. These plots were included in the Abla/Acru h.t., which has not been described in other studies.

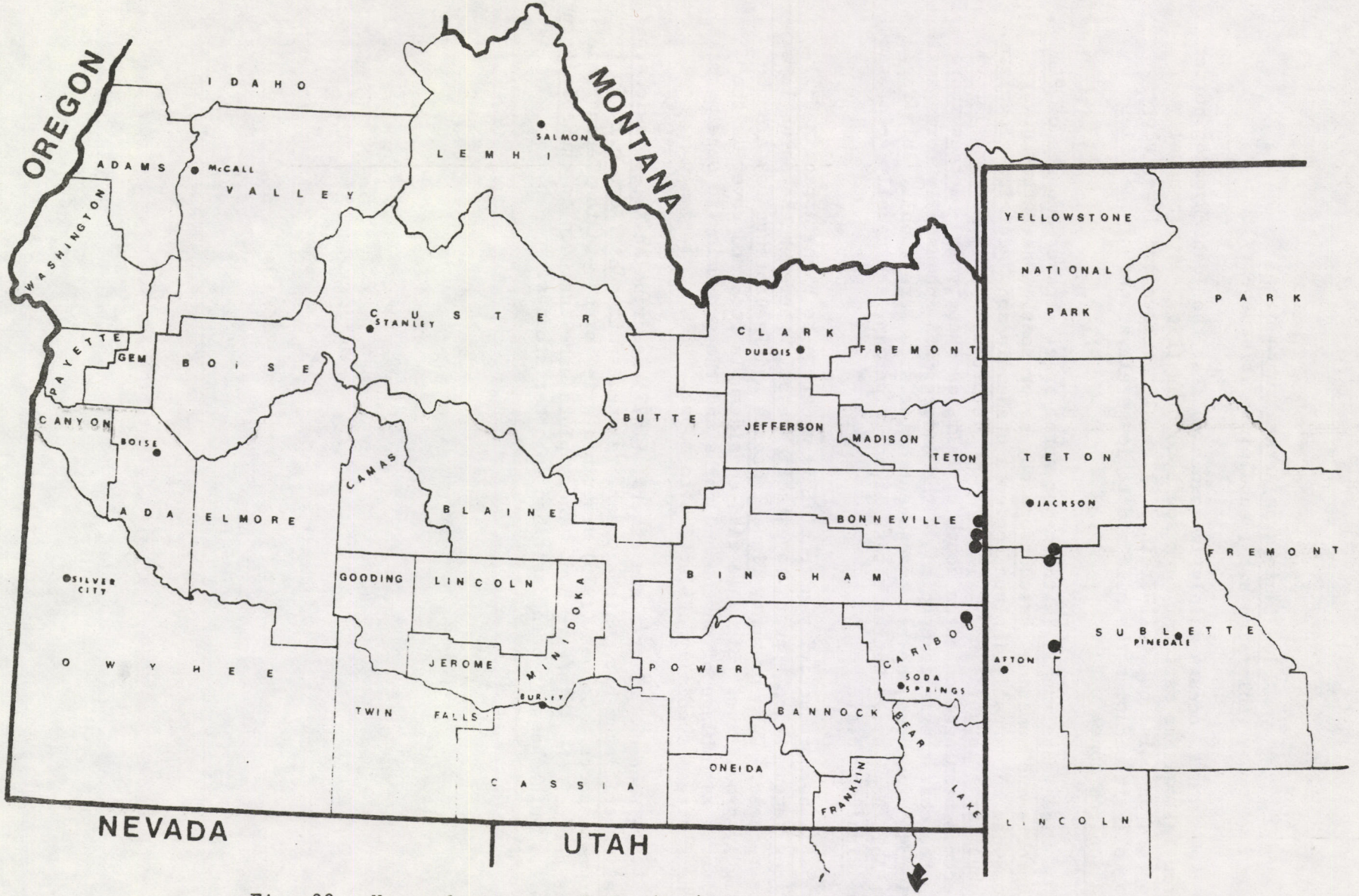


Fig. 23. Known locations of the Abies lasiocarpa/Physocarpus malvaceus h.t.

Abies lasiocarpa/Physocarpus malvaceus h.t.
(Abla/Phma h.t.; subalpine fir/ninebark)

The Abla/Phma h.t. occurs from the Hoback River and Palisades Reservoir southward into Utah (Fig.). It usually occupies fairly steep northerly aspects at the warm lower limits of the Abies lasiocarpa zone.

Pseudotsuga is the major seral tree on these sites. Lesser amounts of Picea are often present but other seral conifers seldom grow here. Physocarpus malvaceus dominates an undergrowth that usually includes Ameanchier, Pachistima, Spiraea, Acer glabrum and Clematis columbiana. The most common forbs are Disporum trachycarpum, Fragaria vesca, and Arnica cordifolia.

Timber productivity potential is low to moderate (Appendix C-3). Pseudotsuga should regenerate easily wherever openings in the shrub and tree canopies occur. Abies lasiocarpa appears fairly productive and should regenerate well where the shrub layer is reduced. In some areas big game use this h.t. extensively for food and cover. Moose, especially, have depleted the Abies giving some sites the appearance of a Psme/Phma h.t.

Henderson and others (1976) previously described this h.t. in northern Utah and adjacent Idaho. No other studies have reported an Abla/Phma h.t.

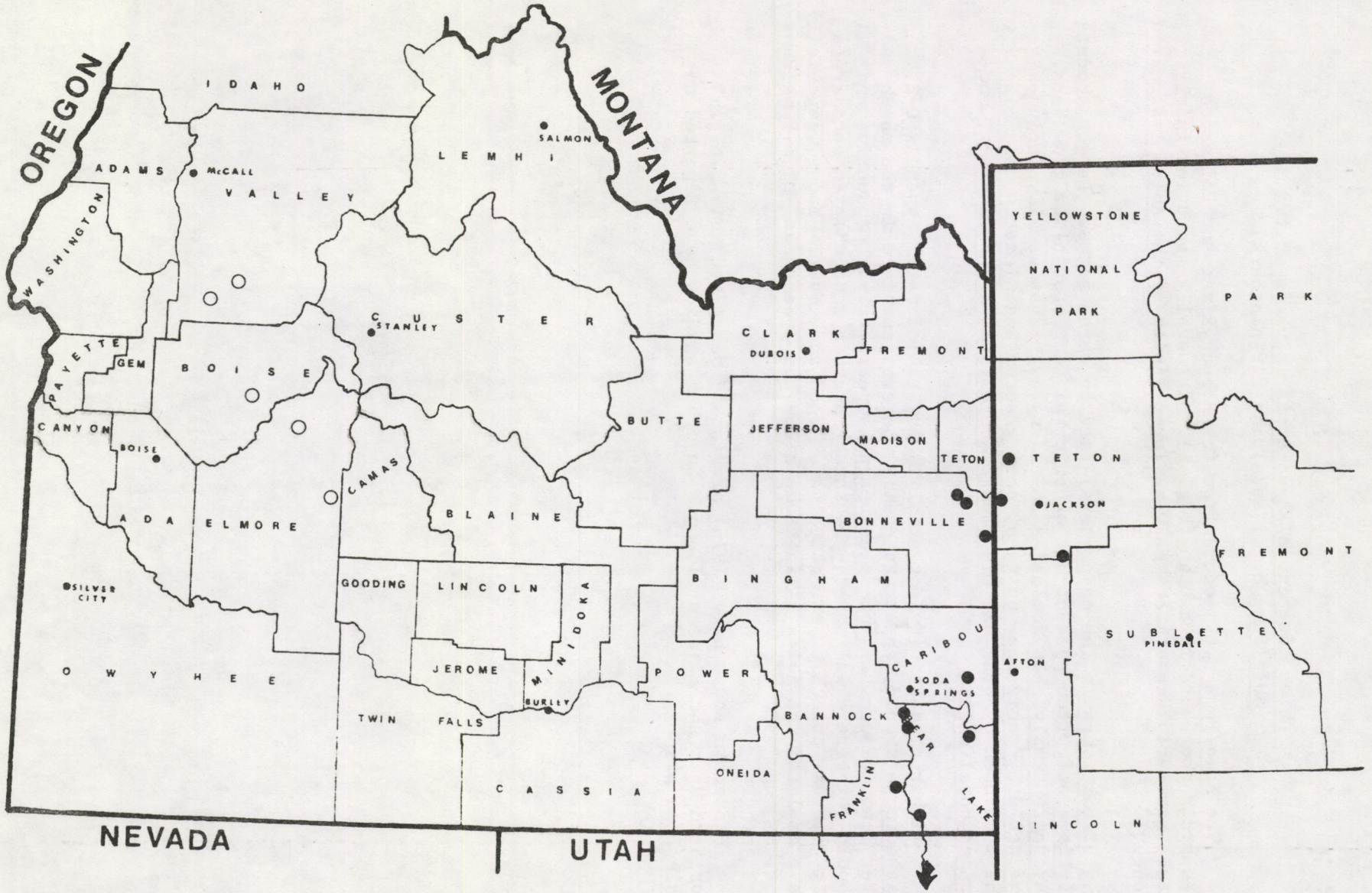


Fig. 24. Known locations of the Abies lasiocarpa/Acer glabrum h.t., Pachistima myrsinites phase (●); Acer glabrum phase (○).

Abies lasiocarpa/Acer glabrum h.t.
(Abla/Acgl h.t.; subalpine fir/mountain maple)

The Abla/Acgl h.t. occurs from the Snake River Range and Hoback River southward through the Wasatch Range into Utah (Fig.). It is found at mid to lower elevations of the Abies lasiocarpa zone where it occupies steep to moderate slopes having northerly aspects. Within this area, the Abla/Acgl h.t. should be treated as the Pachistima myrsinites phase (Abla/Acgl h.t., Pamy phase). This denotes a geographic distinction from the Abla/Acgl h.t., Acgl phase in central Idaho (Steele and others, 1975).

Pseudotsuga and Picea are common seral dominants in this h.t. and Pinus contorta is occasionally present. Tall shrubs that include Acer glabrum, Sorbus scopulina, and, in seral stands, Amelanchier dominate the undergrowth. Pachistima myrsinites is usually present in a subordinant shrub layer that may include Rubus parviflorus, Lonicera utahensis and Vaccinium globulare.

When Brachythecium collinum or B. volutinum are present, they may create a notable moss layer but small amounts of Eurhynochium pulchollum appear more consistently throughout the h.t.

Timber productivity potential is moderate to high (Appendix C-3). Pseudotsuga is usually the most productive tree on the site. It should regenerate easily on suitable seedbeds that occur beneath openings in the tree and shrub canopy. Reduction in the tree canopy should stimulate development of the shrub layer. The shrubs provide ample food and cover for big game but may suppress conifer seedlings.

Henderson and others (1976) first described the Abla/Acgl h.t. within the study area and noted its similarity to that of central Idaho (Steele and others, 1975) but made no phasal separation. No other studies have reported this h.t.

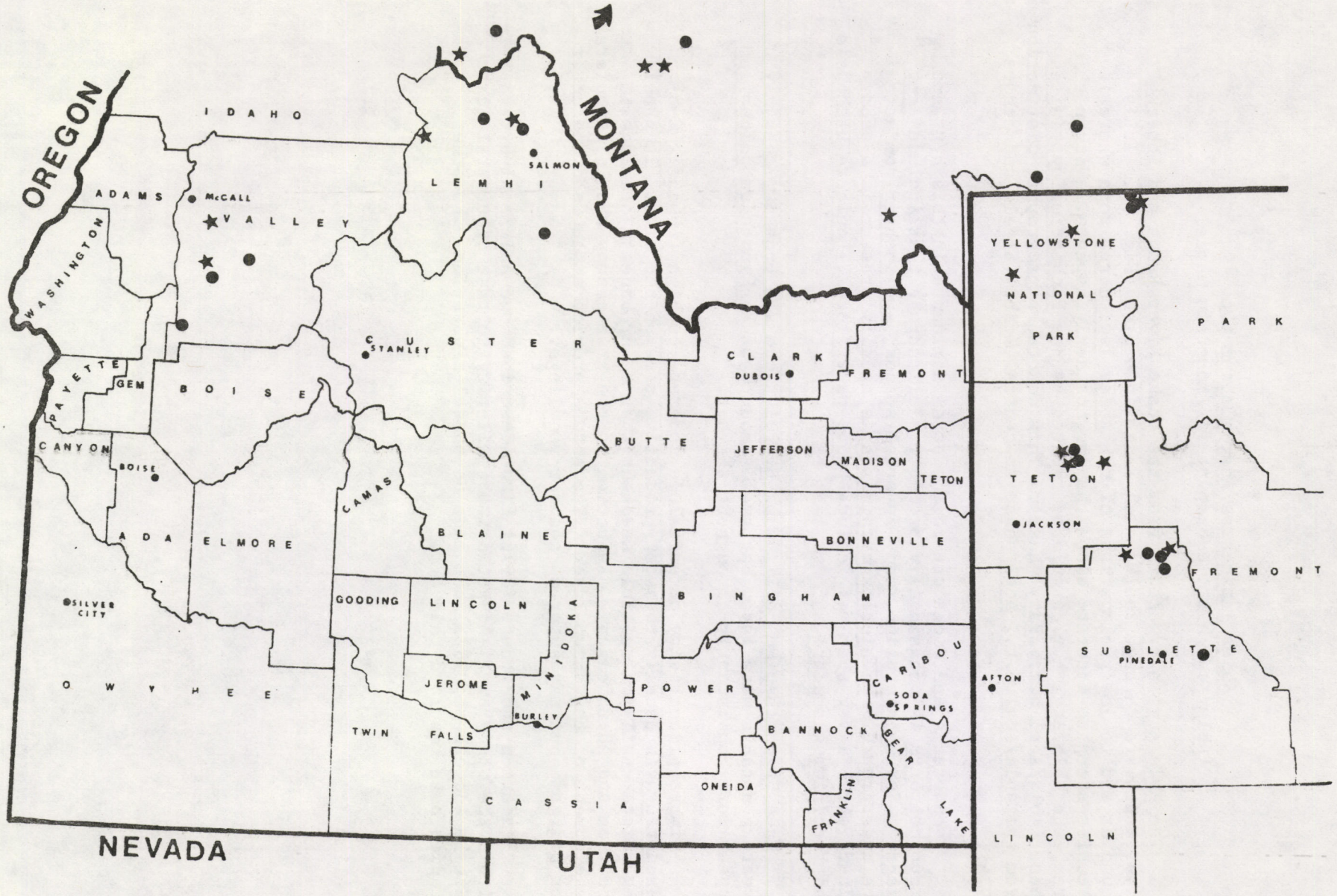


Fig. 25. Known locations of the Abies lasiocarpa/Linnaea borealis h.t., Vaccinium scoparium phase (★); Linnaea borealis phase (●).

Abies lasiocarpa/Linnaea borealis h.t. (Abla/Libo h.t.; subalpine fir/twinflower)

The Abla/Libo h.t. occurs in the Wind River Mountains northward to Yellowstone Park and central Montana. Small amounts also appear in central Idaho (Fig. 25). This h.t. is most common on gentle slopes and benches at mid to lower elevations of the Abies lasiocarpa zone.

Pinus contorta followed by Picea engelmannii are the major seral dominants. Occasionally Pseudotsuga is also present. Linnaea is common throughout the stand even though other shrubs may create the dominant aspect. Calamagrostis rubescens may be present in conspicuous amounts.

Vaccinium scoparium phase (Abla/Libo h.t., Vasc phase)

This phase apparently represents a broad transition to the colder Abla/Vasc h.t. Vaccinium scoparium normally dominates the undergrowth and Lonicera utahensis is generally present.

Linnaea borealis phase (Abla/Libo h.t., Libo phase)

The Libo phase appears to have a relatively moderate environment for the mountain ranges in which it occurs. Berberis repens and Sheperdia canadensis are often present. The Sheperdia may increase following disturbance but shrubs in general are widely scattered and have thin canopies.

Timber productivity potential is low to moderate in the Vasc phase and moderate in the Libo phase (Appendix C-3). The gentle terrain associated with this h.t. facilitates intensive timber management. Pinus contorta can regenerate easily on most sites in the Vasc phase and in portions of the Libo phase. Picea appears to be the most successful seral tree in most of the Libo phase. Moose and sometimes elk use these sites extensively. The moose browse heavily on Abies here and often deform or kill the young trees.

Cooper (1975) has described this h.t. in the study area as the Picea-Abies/Linnaea borealis h.t. The Abla/Libo h.t. was also described in Montana (Pfister and others, 1977) and in central Idaho (Steele and others, 1975). A few stands recorded by Hoffman and Alexander (1976) in the Bighorn Mountains of Wyoming also conform to this h.t.

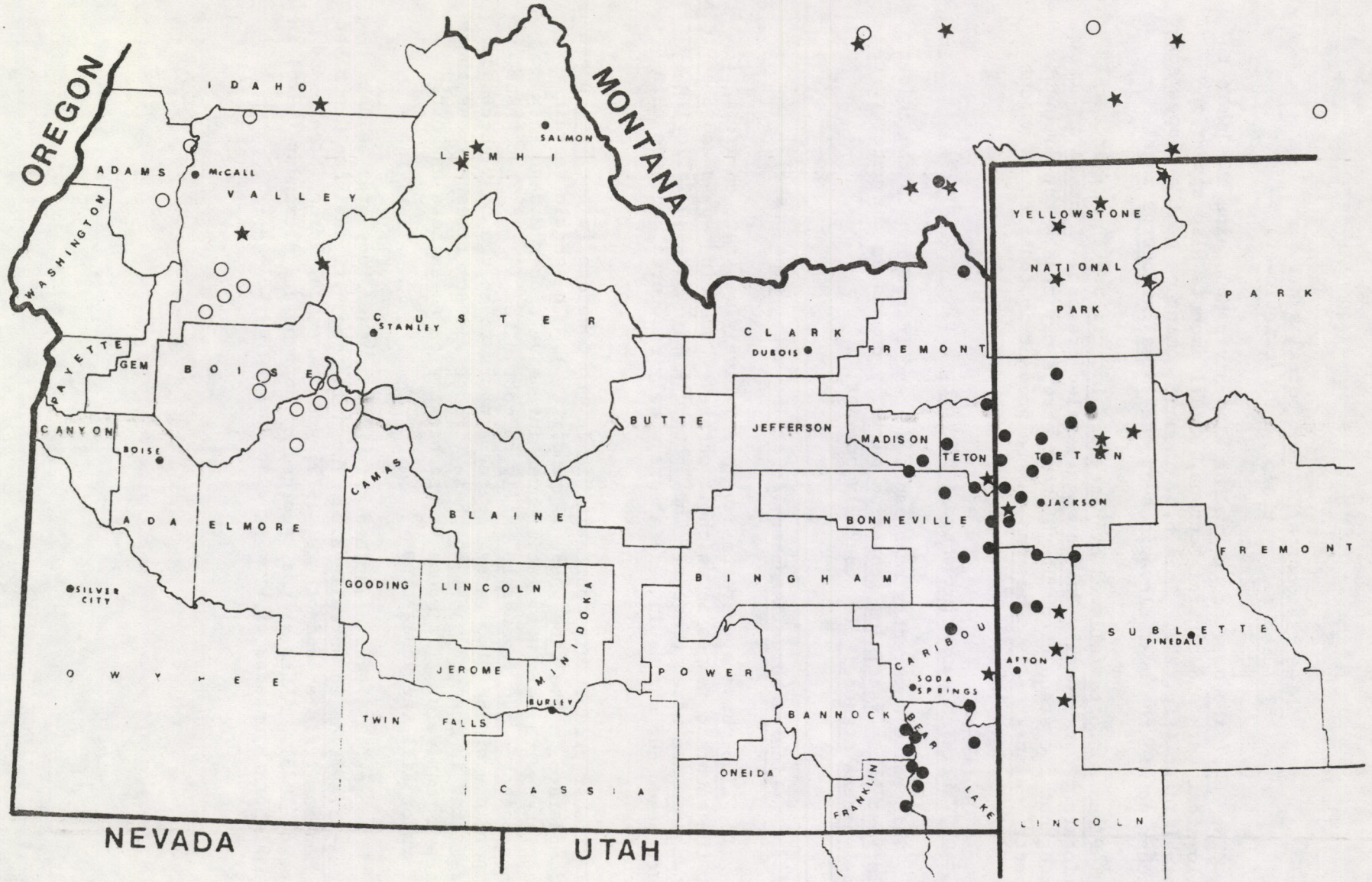


Fig. 26. Known locations of the Abies lasiocarpa/Vaccinium globulare h.t., Pachistima myrsinites phase (●); Vaccinium scoparium phase (★); Vaccinium globulare phase (○).

Abies lasiocarpa/Vaccinium globulare h.t. (Abla/Vagl h.t.; subalpine fir/tall huckleberry)

The Abla/Vagl h.t. is widespread in our area, occuring from Yellowstone Park southward into the Wasatch Mountains of northern Utah (Fig. 26). It also extends into Montana and central Idaho. It generally occurs on northerly to easterly aspects at mid to lower elevations of the Abies lasiocarpa zone. Three phases are recognized within this h.t. Two of these occur in the study area as described below. The third phase (Vaccinium globulare phase) occurs mainly in central Idaho and Montana and follows earlier descriptions of the h.t. (Steele and others, 1975; Pfister and others, 1977).

Pseudotsuga, Pinus contorta, and Picea engelmannii are the common seral dominants of this h.t. Vaccinium globulare forms a dominant layer in the undergrowth and Lonicera utahensis and Pachistima are usually present.

Pachistima myrsinites phase (Abla/Vagl h.t., Pamy phase)

This is the common phase throughout much of the study area, especially in the southern half. It represents a geographic variant of the Abla/Vagl h.t. Pachistima provides the best nomenclatural distinction since it appears in most stands of this phase and is totally absent in the Vagl phase. This phase indicates a relatively moderate environment and often borders the Abla/Acgl h.t. or the Pseudotsuga series. Usually Pseudotsuga and Aster engelmannii are more prevalent here than in the Vasc phase.

Vaccinium scoparium phase (Abla/Vagl h.t., Vasc phase)

The Vasc phase represents a cooler segment of the Abla/Vagl h.t. that is often transitional to the Abla/Vasc h.t. Here, the Vaccinium globulare is normally superimposed on a layer of Vaccinium scoparium. Pinus contorta followed by Picea engelmannii are the dominating seral species. Pseudotsuga, if present, appears in minor amounts.

Pseudotsuga, Picea and Pinus contorta appear moderately productive in this h.t. (Appendix C-1 and C-3). Pseudotsuga grows quite well in the Pamy phase and should regenerate easily in small openings having suitable seedbeds. On most sites, Pinus contorta readily invades following fire or logging and creates a light canopy that may benefit Picea seedlings. When the tree canopy is reduced near the moist extreme of this h.t., Vaccinium globulare may increase and compete with conifer seedlings. Most of these sites offer little forage or browse for large herbivores. The cyclic berry crops of Vaccinium create a periodic demand for these sites by bears, grouse, and humans and may warrant management in some areas.

Both Henderson and others (1976) and Cooper (1975) have described the Abla/Vagl h.t. in our area. It is also reported from Montana (Pfister and others, 1977) and central Idaho (Steele and others, 1975). However, none of these studies reported the phases as described above.

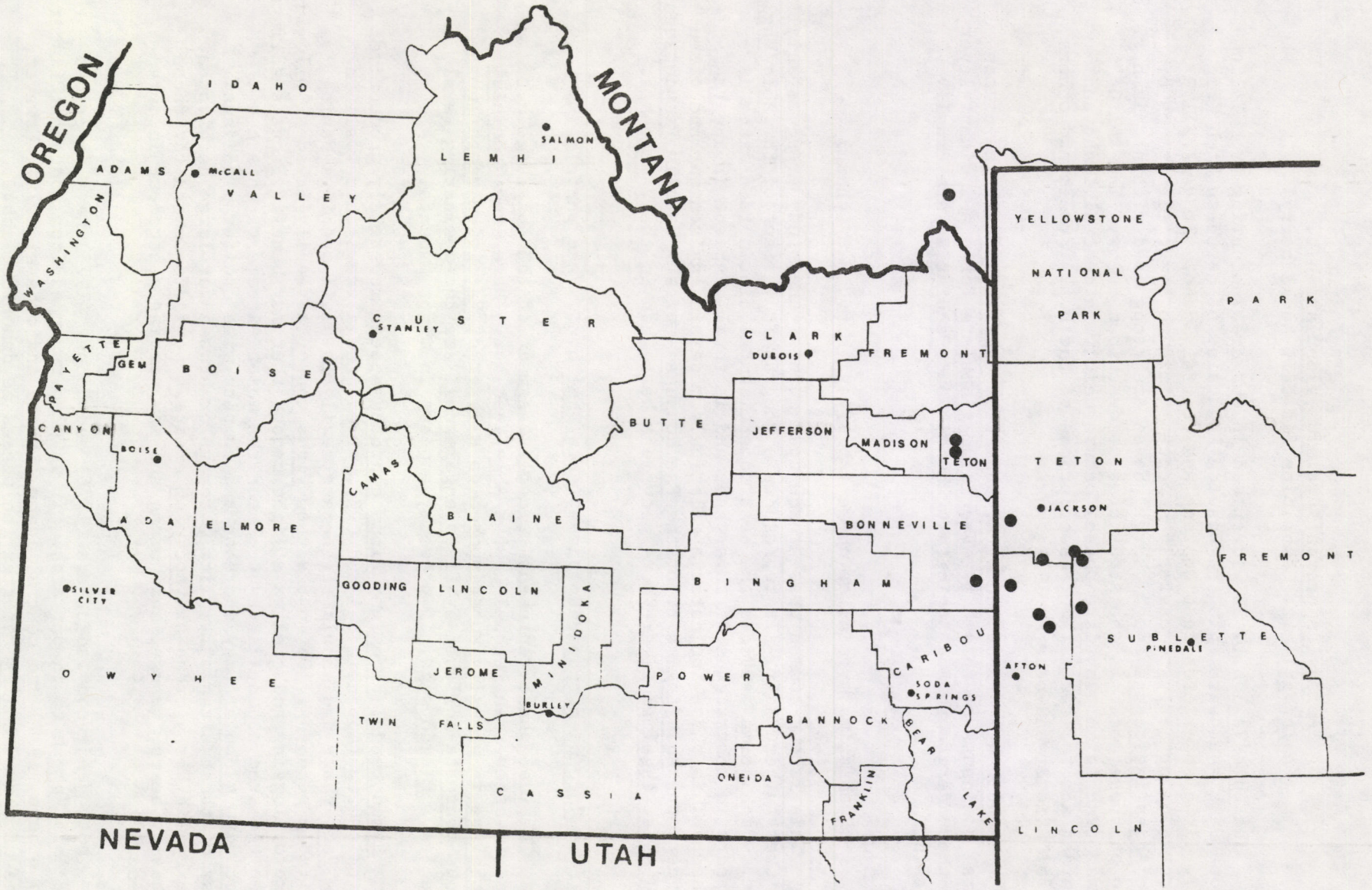


Fig. 27. Known locations of the Abies lasiocarpa/Symphoricarpos albus h.t.

Abies lasiocarpa/Symphoricarpos albus h.t.
(Abla/Syal h.t.; subalpine fir/common snowberry)

The Abla/Syal h.t. is found mainly in lower drainages of the Greys and Hoback Rivers and near Palisades Reservoir (Fig.). It also occurs in the Big Hole Mountains west of Driggs, Idaho and occasionally northward. This h.t. occupies benches, lower slopes and well drained alluvial terraces. It appears at lower elevations of the Abies lasiocarpa series where it often borders the Abla/Phma h.t. or the Pseudotsuga series.

Pinus contorta and Pseudotsuga are the major seral conifers in this h.t. Lesser amounts of Picea engelmannii and sometimes Populus tremuloides may be present. Amelanchier alnifolia often forms a notable layer, especially in seral stands. Symphoricarpos albus creates a light canopy throughout the stand and often overtops a layer of Calamagrostis rubescens.

Timber productivity potential is low to moderate (Appendix C-3). Both Pseudotsuga and Pinus contorta should regenerate easily where the tree canopy has been removed. Special site preparations may be needed when high coverages of graminoids are present. Big game may use these sites extensively because of the gentle terrain and relatively low elevations. Palatable browse species are often reduced considerably and succession to Abies lasiocarpa may be restrained by moose using the Abies.

This h.t. has not been described in other studies.

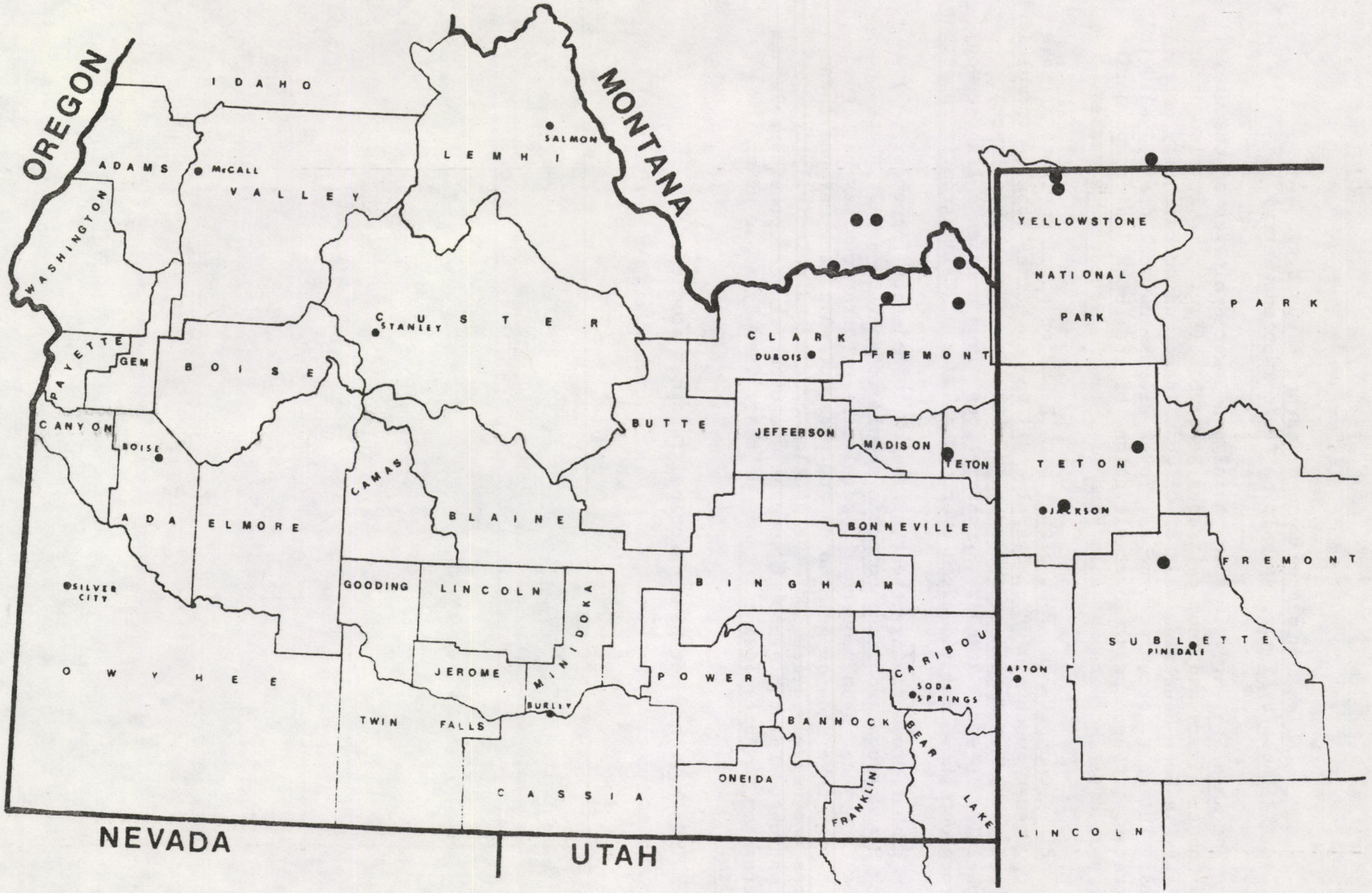


Fig. 28. Known locations of the Abies lasiocarpa/Thalictrum occidentale h.t.

Abies lasiocarpa/Thalictrum occidentale h.t.
(*Abla/Thoc* h.t.; subalpine fir/western meadowrue)

The *Abla/Thoc* h.t. occurs mainly from Yellowstone Park and adjacent Montana southward to the extreme north end of the Wind River Range (Fig. 28). It occupies gentle to moderate terrain at mid elevations of the *Abies lasiocarpa* zone and appears on a variety of aspects.

Pinus contorta and *Picea engelmannii* are the most common seral dominants. Occasionally *Pseudotsuga* dominates seral stands and *Pinus albicaulis* may be present in small amounts. Although several shrub species may be present, forbs generally dominate the undergrowth. Of these forbs, *Thalictrum occidentale*, *Arnica cordifolia* and *Osmorhiza chilensis* are the most common.

If present, *Pinus contorta* or *Pseudotsuga* should regenerate well in openings. A partial tree canopy may benefit *Picea* seedlings by providing protection from wind and intense sunlight. Big game may seek these sites for the numerous forbs but most of this use would occur during the growing season.

A slightly broader version of this h.t. was described by Cooper (1975) within our study area. No other studies have reported on *Abla/Thoc* h.t.

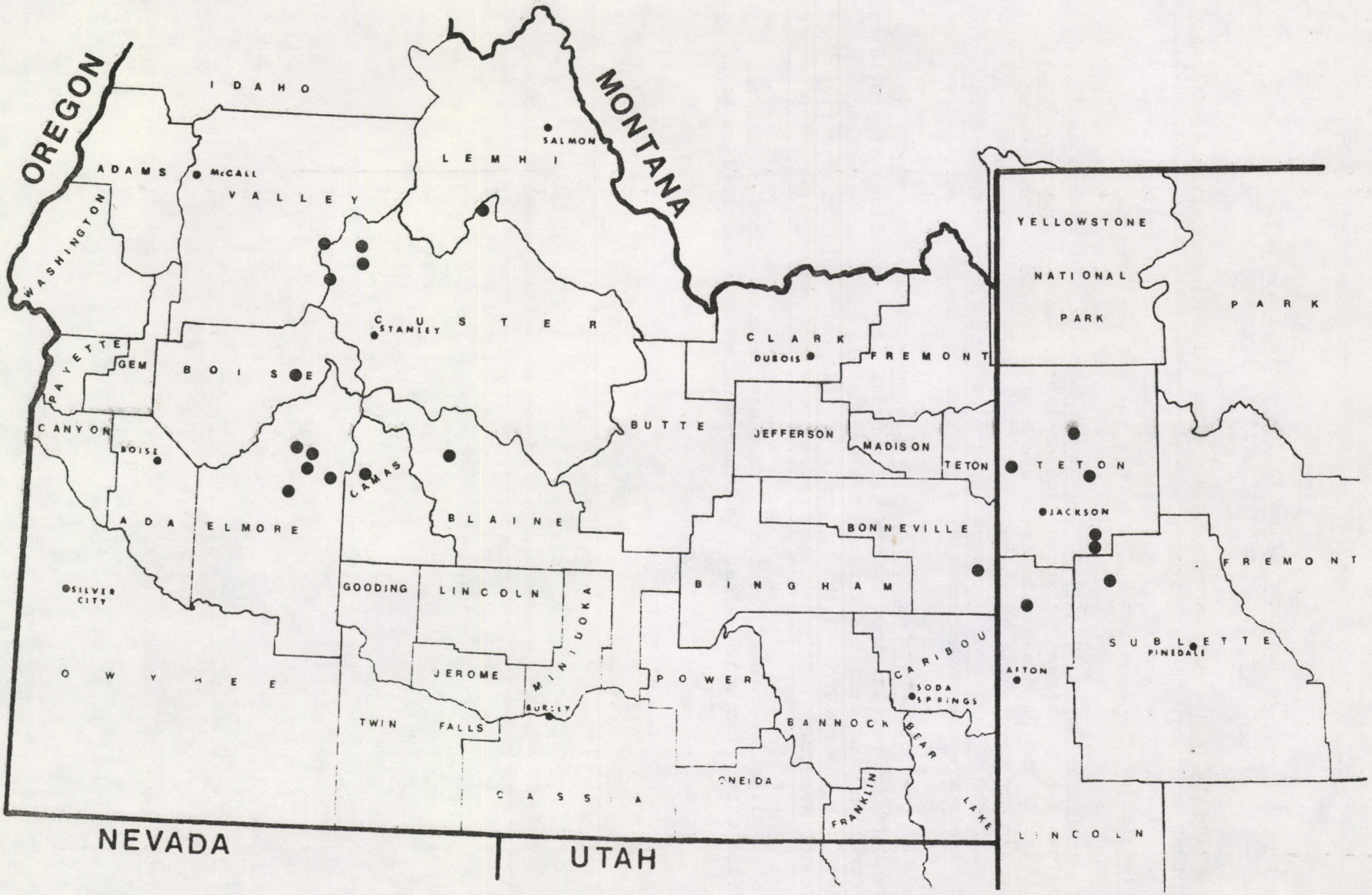


Fig. 29. Known locations of the Abies lasiocarpa/Spiraea betulifolia h.t.

Abies lasiocarpa/Spiraea betulifolia h.t.
(*Abla/Spbe* h.t.; subalpine fir/white spiraea)

The *Abla/Spbe* h.t. is found mainly in the Hoback and Greys River drainages at moderate elevations of the *Abies lasiocarpa* zone (Fig.). Similar conditions also appear in central Idaho. The h.t. occupies steep to gentle slopes having westerly to southerly aspects.

Pinus contorta and *Pseudotsuga* usually dominate seral stands with *Pseudotsuga* being the more frequent dominant. *Picea engelmannii* may be present in lesser amounts. *Amelanchier*, *Lonicera*, *Berberis* and *Sorbus* are common shrubs here but seldom have high coverages. *Pachistima* is often present and may codominate the shrub layer with *Spiraea*.

Timber productivity potential is moderate (Appendix C-3). *Pinus contorta* and *Pseudotsuga* should regenerate easily on suitable seedbeds that receive ample sunlight. If present, *Picea* seedlings may prefer smaller openings that afford some site protection. Big game seek food and shelter here throughout much of the summer and fall but domestic livestock are seldom attracted to these sites.

Within the study area this h.t. conforms to portions of Cooper's (1975) *Abla/Vagl* h.t., *Spbe* phase. The *Abla/Spbe* h.t. also occurs in central Idaho (Steele and others, 1975) where it lacks *Pachistima* and *Picea*.

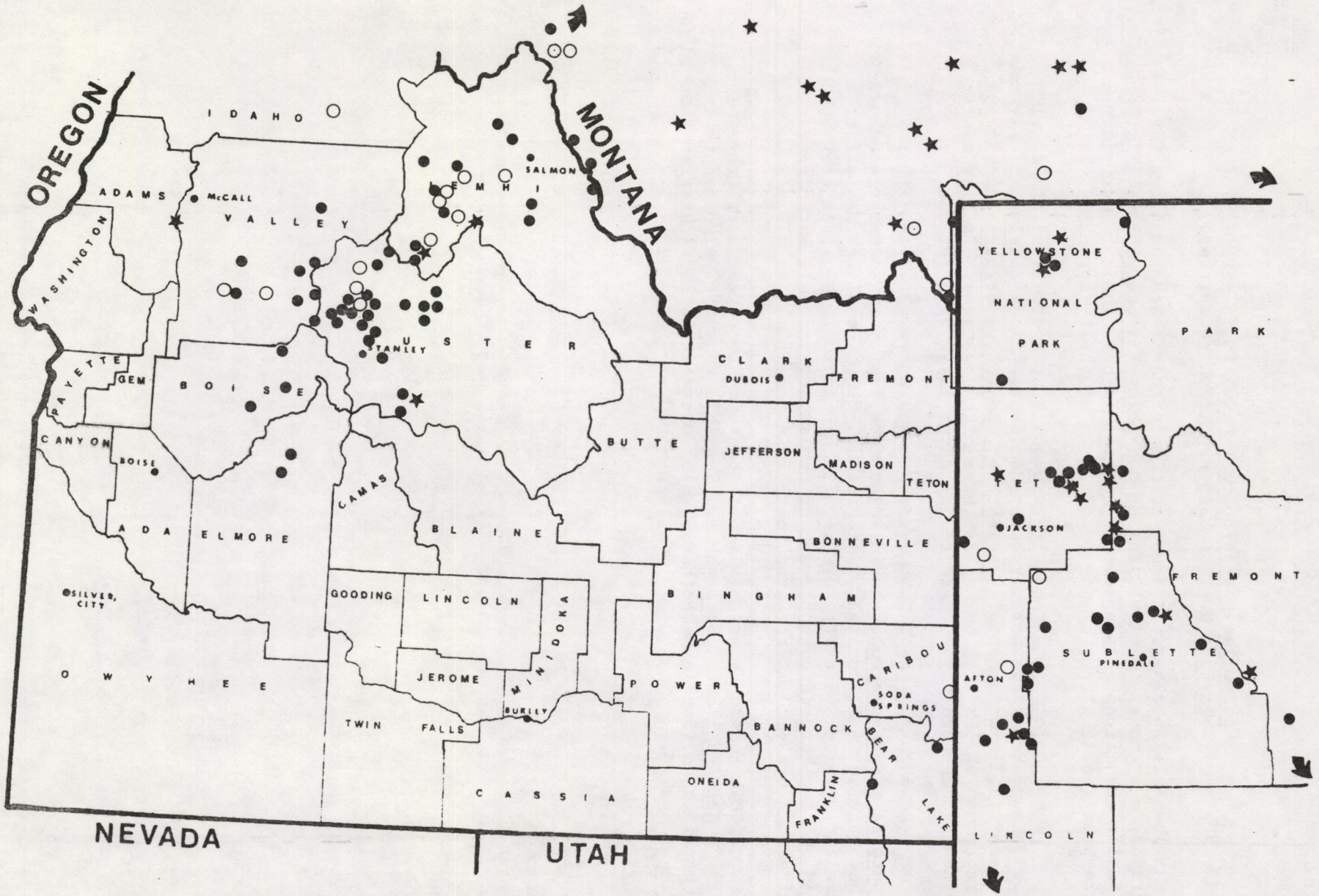


Fig. 30. Known locations of the Abies lasiocarpa/Vaccinium scoparium h.t., Calamagrostis rubescens phase (○); Pinus albicaulis phase (★); Vaccinium scoparium phase (●).

Abies lasiocarpa/Vaccinium scoparium h.t.
(Abla/Vasc h.t.; subalpine fir/grouse whortleberry)

The Abla/Vasc h.t. occurs throughout much of central Idaho, Montana, and western Wyoming (Fig. 30). It extends southward to the Uinta Mountains of Utah, but is absent from much of the basin and range topography to the west. It also ranges eastward to the Bighorn and Medicine Bow Mountains of Wyoming and to the front range of Colorado. In our area, this h.t. occupies a variety of slopes and aspects at mid to upper elevations of the Abies lasiocarpa zone.

This is one of the most widespread subalpine forest h.t.'s, yet it retains a high degree of floristic homogeneity throughout its range. Pinus contorta dominates seral stands throughout most of the type. Picea and Pseudotsuga may be present in minor amounts. A low cover of Vaccinium scoparium usually dominates the undergrowth. Other shrubs if present are generally sparse and widely scattered. Total species composition also varies with the phases noted below.

Calamagrostis rubescens phase (Abla/Vasc h.t., Caru phase)

At lower elevations of the Abla/Vasc h.t., Calamagrostis rubescens may codominate the undergrowth with Vaccinium. Here, Pseudotsuga and Pachistima may appear more frequently. Conceptually this phase represents a broad transition between the Abla/Vasc and Abla/Caru h.t.s.

Pinus albicaulis phase (Abla/Vasc h.t., Pial phase)

This phase appears in upper elevations of the Abla/Vasc h.t. It is most common from the Wind River Mountains northward into Montana. Pinus albicaulis codominates most stands with Abies, Picea and Pinus contorta. These stands appear more open than in the other phases and apparently afford Pinus albicaulis a permanent role in the forest community. Conceptually this phase represents a transition between the Abla/Vasc and Pial/Vasc h.t.s.

Vaccinium scoparium phase (Abla/Vasc h.t., Vasc phase)

This is the common phase throughout most of the area. Pinus contorta dominates most seral stands until replaced by Picea and Abies. Pedicularis racemosa, Pyrola secunda, and Arnica cordifolia are common forbs here but usually have low coverages. As opposed to the other two phases, the Vasc phase frequently has a conspicuous moss layer. The most common mosses are Brachythecium collinum, B. velutinum, Pohlia nutans, and Polytricadelphus lyallii. All of these species occasionally produced high coverages but B. collinum and B. velutinum were the most frequent moss dominants.

Timber productivity ranges from low to moderate (Alpendix C-3). Pinus contorta will regenerate in unshaded openings. Complete overstory removal may be detrimental to existing seedlings of Picea and Abies. Also, attempts to regenerate trees other than Pinus contorta may assume considerable risk. In the

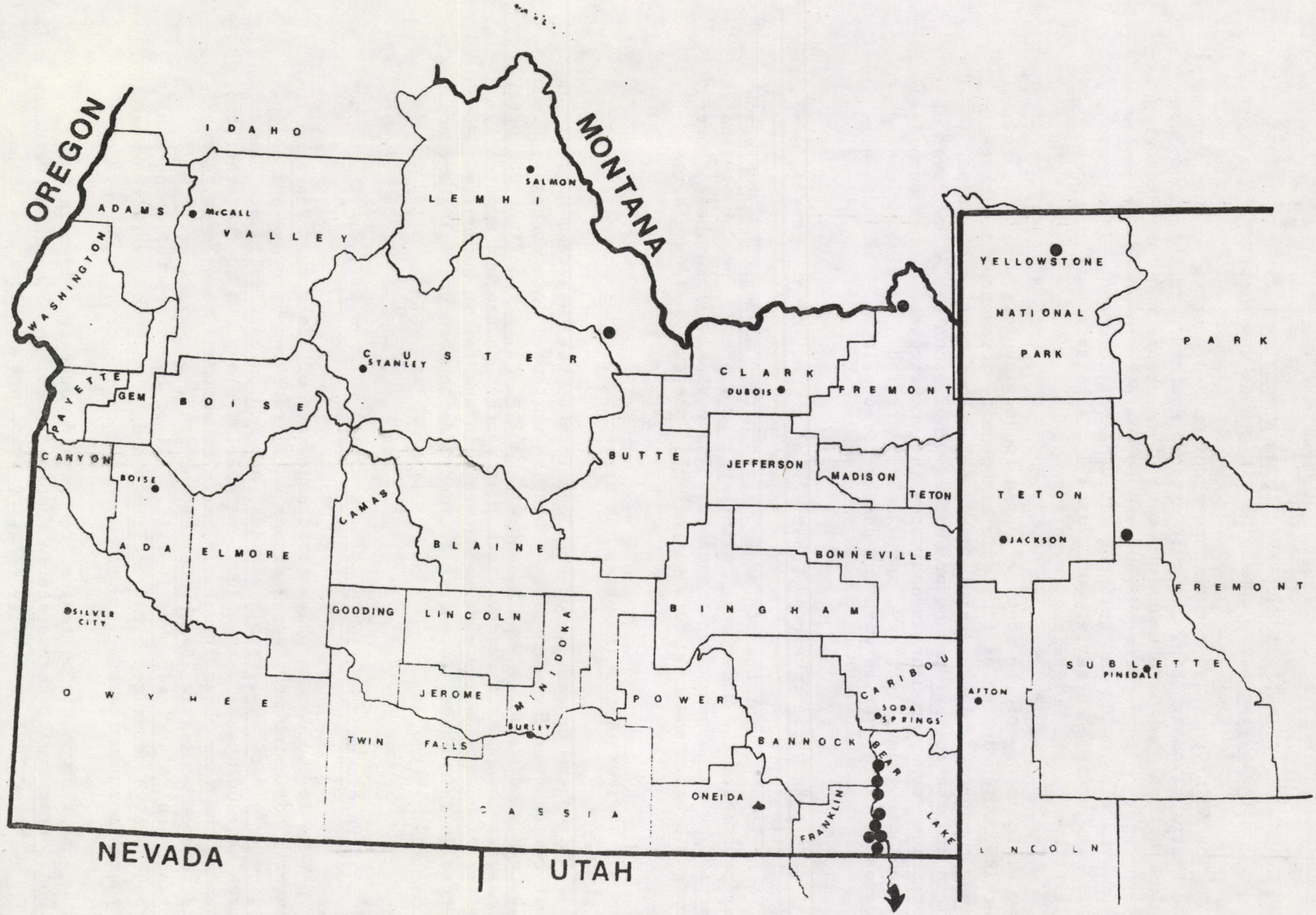


Fig. 31. Known locations of the Abies lasiocarpa/Arnica latifolia h.t.

Caru phase, coverages of Calamagrostis may impede tree regeneration unless there is some site preparation, but complete soil scarification may increase hazards to frost heaving. In the Pial phase, timber production is low and regeneration may be unpredictable. Forage production is low on most sites because of short growing seasons, low numbers of forage species, and shade of the tree canopy. This h.t. may have high watershed valeu because of heavy annual snowpacks, especially in the Pial phase.

This widespread h.t. has been described in several studies. Cooper (1975) and Henderson and others (1976) have recorded it within the study area and a portion of Reed's (1969, 1976) Picea engelmannii/Vaccinium scoparium h.t. also conforms to our description of Abla/Vasc. In surrounding areas, Abla/Vasc h.t. has been reported in the Uinta Mountains of Utah (Pfister, 1972), the Medicine Bow (Wirsing and Alexander, 1975) and Bighorn (Hoffman and Alexander, 1976) mountains of Wyoming, the front range of Colorado (Murr 1961, Moir 1969) Montana (Pfister and others, 1977) and in central Idaho (Steele and others, 1975).

Abies lasiocarpa/Arnica latifolia h.t.
(Abla/Arla h.t.; subalpine fir/ mountain arnica)

The Abla/Arla h.t. occurs mainly in the Wasatch Mountains of southeastern Idaho and adjacent Utah but extends sporadically northward to Yellowstone Park (Fig. 31). It occupies gentle to moderate terrain on all but southerly aspects and usually apears at mid to upper elevations of the Abies lasiocarpa zone. It seems to occupy sites where the Abla/Vasc h.t. would occur if Vaccinium scoparium were present in the area. Since the Abla/Vasc h.t. is absent throughout most of the Great Basin (PFister 1972), it appears that the Abla/Arla h.t. is a geographic replacement of Abla/Vasc.

Picea engelmannii is the major seral species. Lesser amounts of Pinus contorta and occasionally Pseudotsuga may be present. Ribes montigenum and Pachistima are the most common shrubs and occasionally they dominate the site. Usually Arnica latifolia dominates a forb layer that includes Aster engelmannii and Pedicularis racemosa.

Timber productivity potential is moderate (Appendix C-3). Picea grows well on these sites but successful regeneration may depend on the attention given to site preparation and protection from insolation and frost heaving. When present, Pinus contorta should regenerate easily in unshaded openings. Domestic livestock that feed in adjacent areas may seek shade and shelter on these sites and pose a threat to conifer seedlings. Benefits to big game appear limited to cover.

The Abla/Arla h.t. was previously described by Henderson and others (1976) in southeastern Idaho but has not been reported in any other studies.

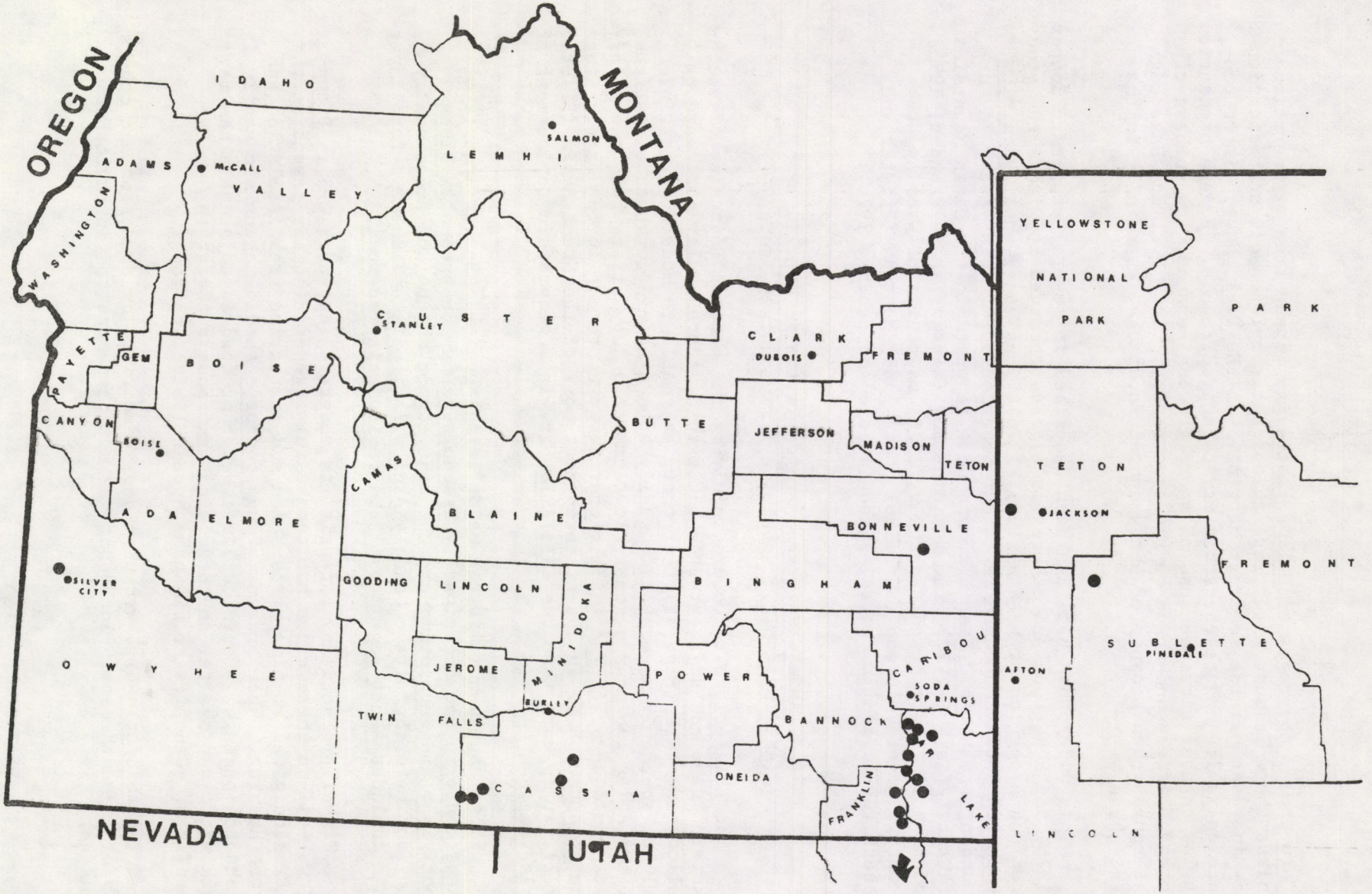


Fig. 32. Known locations of the Abies lasiocarpa/Osmorhiza chilensis h.t..

Abies lasiocarpa/Osmorhiza chilensis h.t. (Abla/Osch h.t.; subalpine fir/mountain sweetroot)

The Abla/Osch h.t. extends across the southern portion of Idaho and southward into Utah (Fig. 32). It is most common on northerly to easterly aspects at mid to lower elevations of the Abies lasiocarpa zone. Adjacent drier sites are often the Abla/Caru h.t. or nonforest communities.

Populus tremuloides, Pinus contorta, and Pseudotsuga are the important seral trees in this h.t. Picea engelmannii and Pinus flexilis may be present in lesser amounts. Shrubs other than Berberis and Pachistima are usually sparse in old growth stands. Osmorhiza is usually a dominant member of a diverse forb layer. Other species characterize the two phases noted below.

Pachistima myrsinites phase (Abla/Osch h.t., Pamy phase)

This phase occurs mainly in the Wasatch Range and occasionally to the northeast. Pachistima usually dominates the undergrowth and Picea is usually present. Osmorhiza depauperata is a codominant in most forb layers. Other species common to this phase include Aquilegia coerulea and Arnica cordifolia.

Osmorhiza chilensis phase (Abla/Osch h.t., Osch phase)

This phase occurs mainly in the Wasatch Range and westward. Picea is scarce in this phase and Symphoricarpos oreophilus and Berberis repens are the common shrubs. Osmorhiza chilensis is often a dominant forb here and its most frequent associates are Thalictrum fendleri and Viola adunca.

Timber productivity appears moderate (Appendix C-3) and conifers should regenerate easily in small openings. Complete removal of the overstory can result in a Populus tremuloides community. Shrubs in adjacent nonforest communities may also invade large clearcuts. Forage production is limited mainly to forbs which grow best beneath a light canopy of Populus tremuloides.

The Abla/Osch h.t. has been described from the southern Sawtooth National Forest (Steele and others, 1974) and was previously recorded for the Caribou National Forest (Henderson and others, 1975).

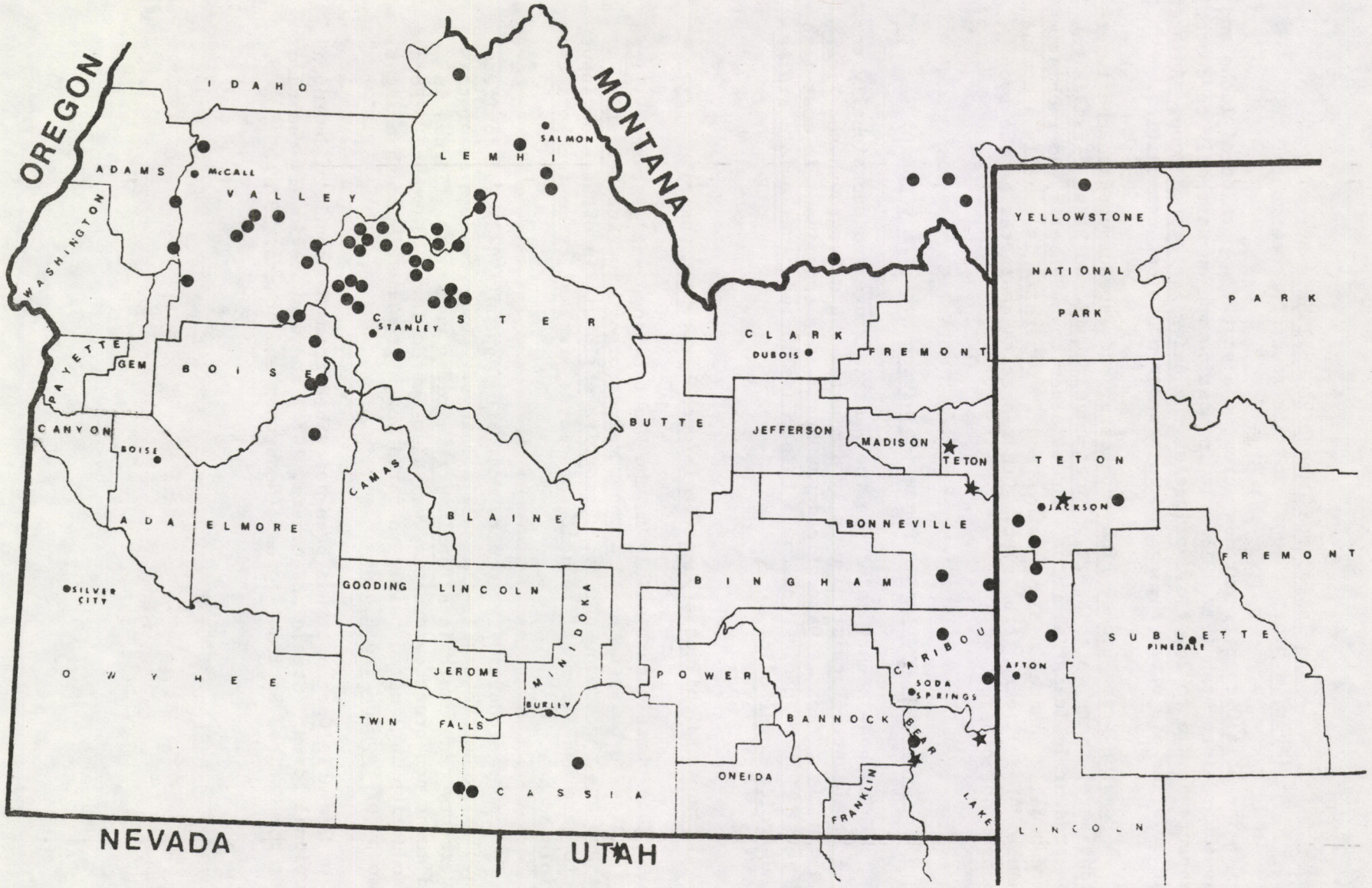


Fig. 33. Known locations of the Abies lasiocarpa/Calamagrostis rubescens h.t., Pachistima myrsinites phase (★); Calamagrostis rubescens phase (●).

Abies lasiocarpa/Calamagrostis rubescens h.t. (Abla/Caru h.t.; subalpine fir/pinegrass)

In the study area the Abla/Caru h.t. occurs mainly from Jackson southward into southeastern Idaho (Fig. 33). It also occurs in south-central Montana, the adjacent portions of Yellowstone Park and in central Idaho. It is notably absent from the Lemhi, Beaverhead, and Wind River portions of the study area. It occupies a variety of aspects on gentle to moderate slopes at lower elevations of the Abies lasiocarpa zone.

Pinus contorta and Pseudotsuga are the major seral dominants of this h.t. Calamagrostis rubescens often accompanied by Carex geyeri creates a conspicuous layer in the undergrowth and shrubs other than Pachistima are usually sparse. Forbs are generally sparse on undisturbed sites.

Pachistima myrsinites phase (Abla/Caru h.t., Pamy phase)

This phase appears intermittently throughout southeastern Idaho and adjacent Wyoming. Pseudotsuga is a consistent seral dominant with Pinus contorta appearing less frequently. Pachistima usually accompanied by Berberis repens forms a layer above the Calamagrostis.

Calamagrostis rubescens phase (Abla/Caru h.t., Caru phase)

This is the common phase throughout the range of the h.t. Pinus contorta is the major seral dominant with Pseudotsuga appearing less frequently. Shrubs in general are sparse and Arnica cordifolia is the only forb commonly present.

Timber productivity potential is low to moderate (Appendix C-3). In the Caru phase, Pinus contorta is the most dependable species for timber production and normally regenerates wherever there is a suitable seedbed with ample sunlight. In the Pamy phase, Pseudotsuga may be the best suited species for timber management even though regeneration may be difficult to attain. If the overstory is removed, the Calamagrostis may increase rapidly and retard seedling establishment. Livestock makes light use of this h.t. but are attracted to recent clearings where the forbs and graminoids have acquired renewed vigor. Here the animals may congregate and trample tree seedlings. Big game, especially elk, will feed on the graminoids present and seral stands will produce some shrubs and forbs with high forage value.

The Abla/Caru h.t. has been described in our area by Henderson and others (1976). It is also reported from Montana (Pfister and others, 1977) and central Idaho (Steele and others, 1975).

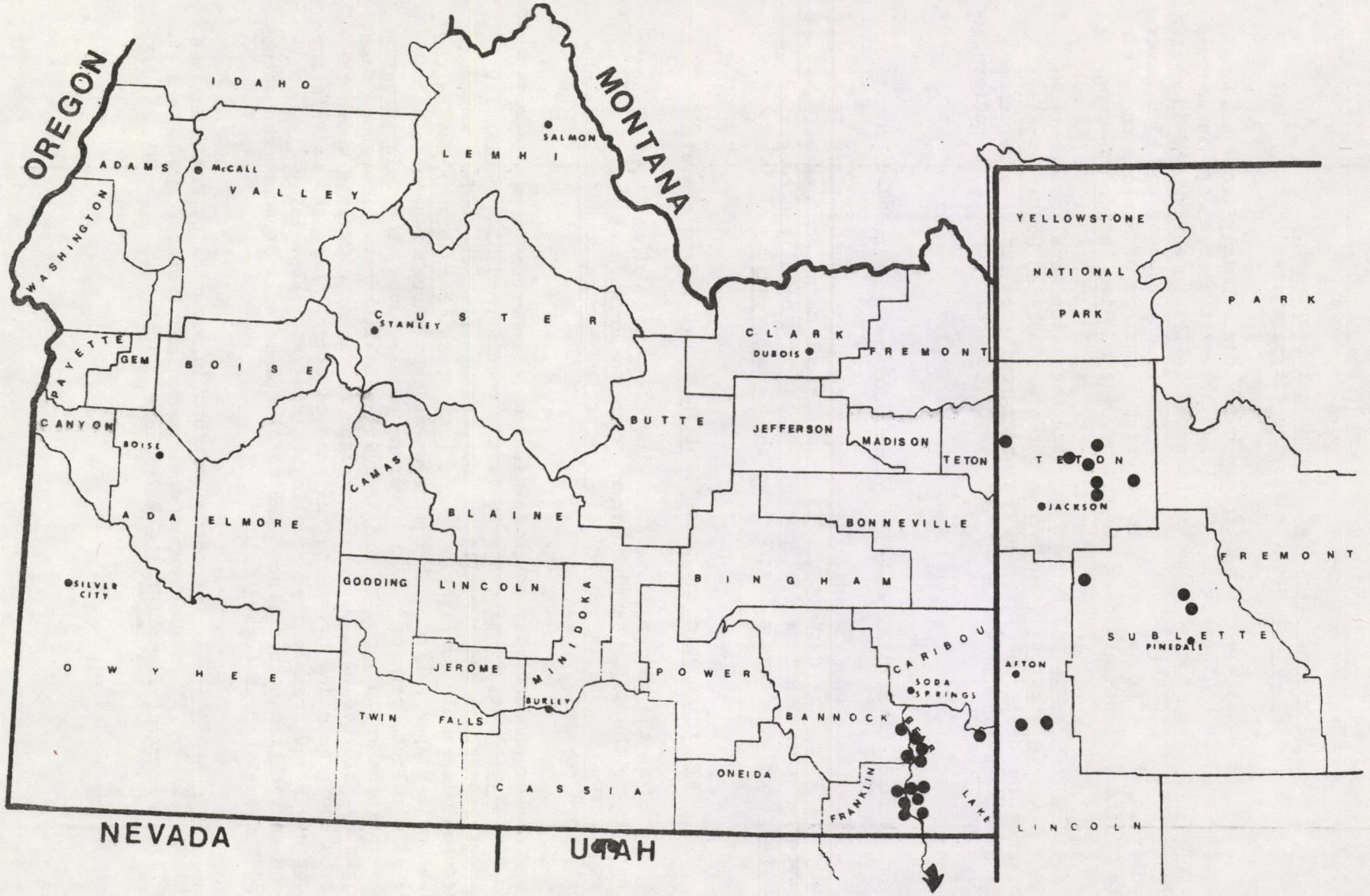


Fig. 34. Known location of the Abies lasiocarpa/Berberis repens h.t.

Abies lasiocarpa/Berberis repens h.t.
(Abla/Bere h.t.; subalpine fir/Oregongrape)

The Able/Bere h.t. occurs throughout much of Utah and extends northward into southeastern Idaho and western Wyoming (Fig. 34). It usually appears at the lower elevations of the Abies lasiocarpa zone where adjacent warmer sites are in the Pseudotsuga series. Although it can occupy a variety of sites, it is most common on moderate slopes having northerly aspects.

Pseudotsuga and Picea are major seral dominants in this h.t. In some areas Populus tremuloides or Pinus contorta will dominate early successional stages. Usually Pachistima dominates the undergrowth and is accompanied by Berberis repens but occasionally the Pachistima is absent. Other common shrubs are Symphoricarpos oreophilus and Sheperdia canadensis. Arnica cordifolia is the most common forb and often has high coverages. The moss, Brachythecium collinum, also appeared frequently in this h.t.

Timber productivity is moderate for major seral conifers in the stand (Appendix C-3). Pinus contorta or Pseudotsuga should regenerate easily on seedbeds that receive amply sunlight. If Populus tremuloides is present it can often dominate newly made openings in the stand. Picea, if present, should establish easily beneath a light canopy of existing conifers and grow well if free of suppression. Domestic livestock seldom spend much time on these sites but deer may use some areas throughout the summer.

Pfister (1972a) first described the Abla/Bere h.t. in Utah and later Henderson and others (1976) recognized it in southeastern Idaho. No other studies have reported this h.t.

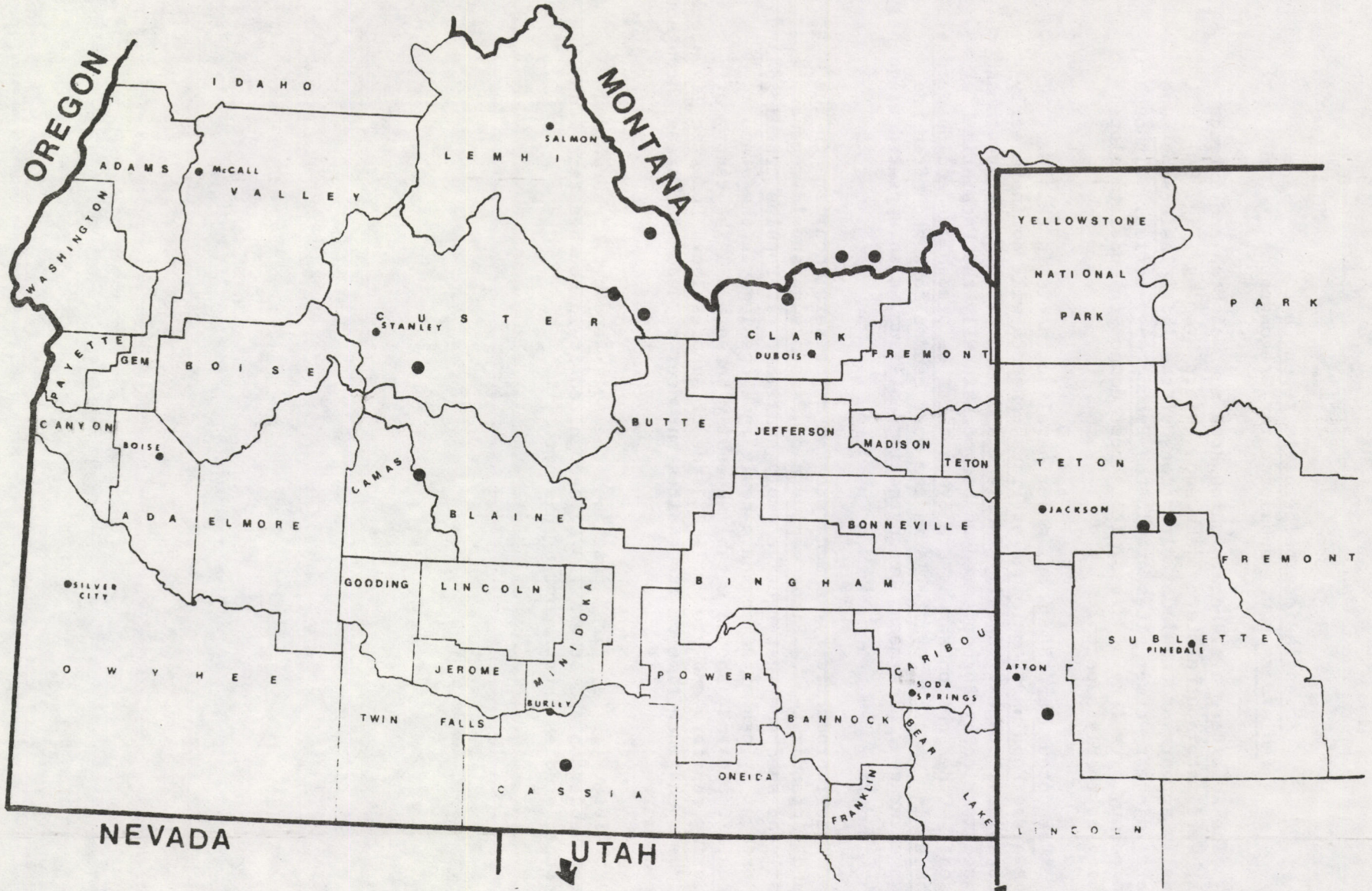


Fig. 35. Known locations of the Abies lasiocarpa/Ribes montigenum h.t.

Abies lasiocarpa/Ribes montigenum h.t.
(Abla/Rimo h.t.; subalpine fir/mountain gooseberry)

The Abla/Rimo h.t. extends from southern Utah northward to Wyoming, east central Idaho, and adjacent Montana (Fig.). It appears at the highest elevations of the forested zone and seldom occurs below 8,000 feet. It may occupy various slopes but is usually on northerly aspects.

Picea engelmannii is the major seral species. Other seral conifers are usually sparse. Undergrowths are often quite depauperate with Ribes montigenum being the only conspicuous shrub. Occasionally the Ribes will form a dense layer.

Timber productivity is low to moderate (Appendix C-3) and tree regeneration may be sporadic. Picea should regenerate best where it receives protection from frost heaving and intense insulation. In southern Utah (Pfister, 1972b) it was shows that trees have difficulty getting established in clearcuts because of the severe environment within this h.t. Big game and livestock may seek shelter on these sites but find little forage here. Snowpacks persist late into the growing season and, in some areas, may be the most valuable resource present.

Pfister (1972a) first described the Abla/Rimo h.t. in Utah. It was later reported from central Idaho (Steele and others, 1975), adjacent Montana (Pfister and others, 1977), and southeastern Idaho (Henderson and others, 1976).

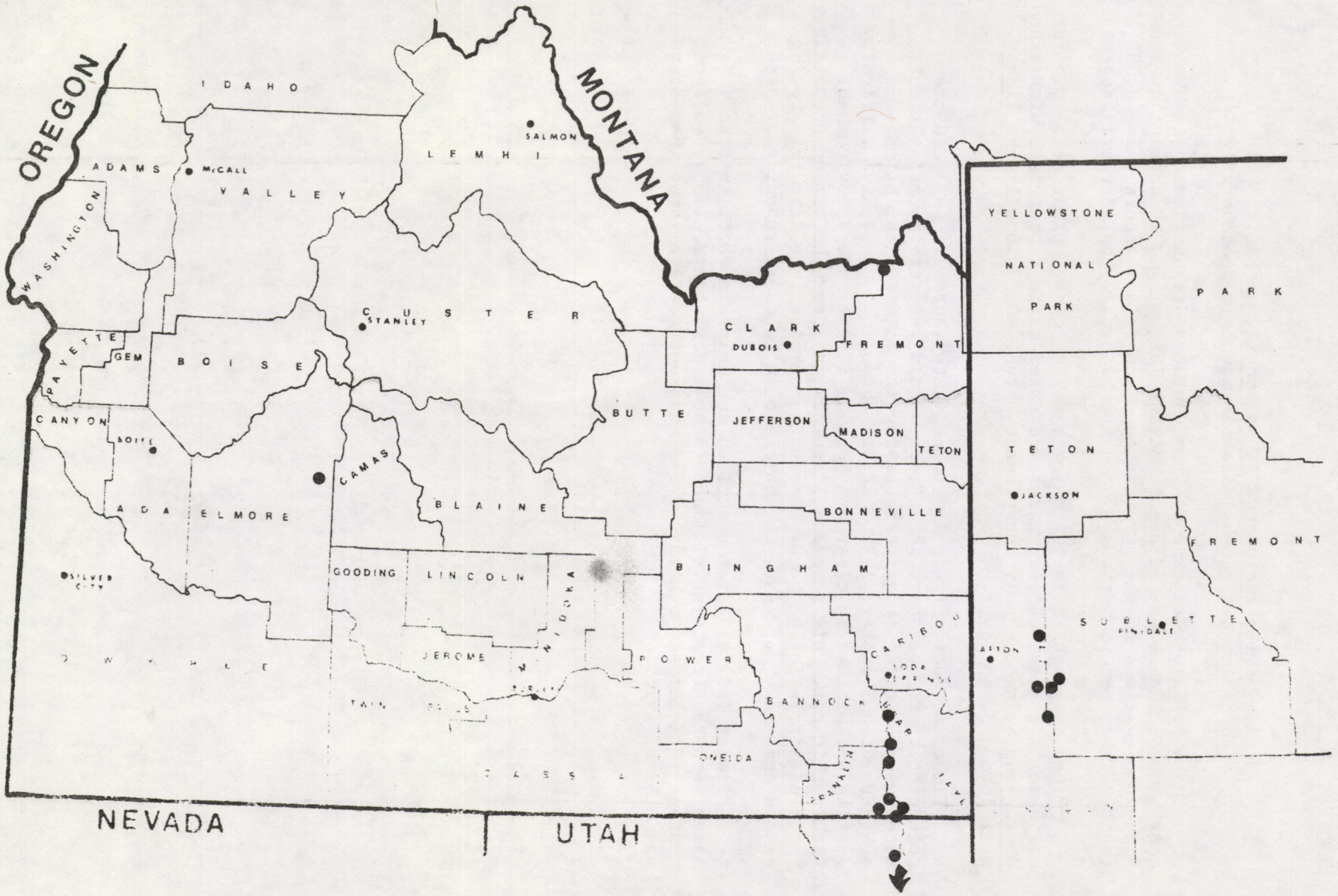


Fig. 36. Known locations of the Abies lasiocarpa/Pedicularis racemosa h.t. ( ).

Abies lasiocarpa/Pedicularis racemosa h.t.
(Abla/Pera h.t.; subalpine fir/pedicularis)

This h.t. occurs mainly in southeastern Idaho and adjacent Wyoming and extends southward into Utah (Fig. 36). It is found at mid to upper elevations of the *Abies lasiocarpa* zone and occupies a variety of aspects on gentle to moderately steep terrain.

Pinus contorta, followed by *Picea* and *Pseudotsuga*, are the major seral trees. *Symphoricarpos oreophilus*, *Pachistima myrsinites*, and *Ribes montigenum* are common shrubs here but they usually have low coverage. *Pedicularis racemosa* is common throughout the stands and often dominates the forb layer.

Timber productivity potential ranges from low to high (Appendix C-3). *Pinus contorta* grows well here and should establish easily where competing vegetation is removed. *Picea* and sometimes *Pseudotsuga* should also establish easily in small openings or in partial shade.

The *Abla/Pera* h.t. was first described by Henderson and others (1976). It has not been mentioned in other studies.

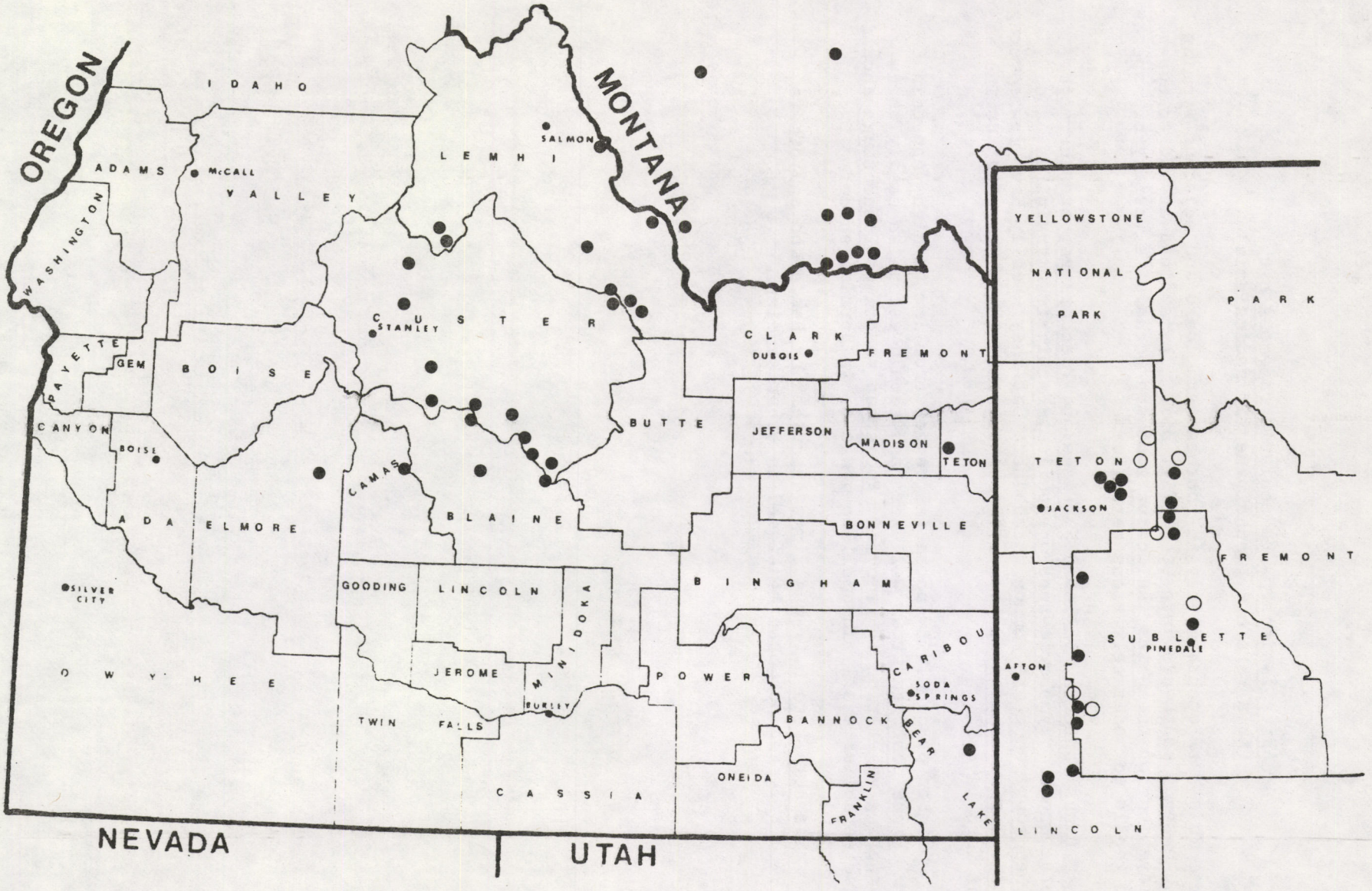


Fig. 37. Known locations of the Abies lasiocarpa/Arnica cordifolia h.t., Astragalus miser phase (○); Arnica cordifolia phase (●).

Abies lasiocarpa/Arnica cordifolia h.t.
(Abla/Arco h.t.; subalpine fir/heartleaf arnica)

The Abla/Arco h.t. occurs mainly in east central Idaho and southwestern Montana but also appears in the Wind River Mountains and southward in Wyoming (Fig. 37). It usually occurs at lower elevations of the Abies lasiocarpa zone and is common on all but southerly aspects. The terrain is usually gentle to moderate.

Pinus contorta is usually a dominant seral species followed by Picea or Pseudotsuga. Although Sheperdia may dominate the undergrowth of seral stands other shrubs are usually sparse. Arnica cordifolia generally dominates or codominates a light forb layer.

Astragalus miser phase (Abla/Arco h.t., Asmi phase)

The Asmi phase was found mainly in the Wind River Range of Wyoming (Fig. 38). Pinus contorta is the major seral tree on these sites. If Pseudotsuga or Picea are present they are usually widely scattered. Small amounts of Juniperus communis and Sheperdia are common here and occasionally the Sheperdia will dominate following fire. Astragalus miser is usually a conspicuous member of a very depauperate forb layer. Mosses are usually quite sparse but small amounts of Ceratodon purpurous are common.

Arnica cordifolia phase (Abla/Arco h.t., Arco phase)

This is the characteristic phase of east central Idaho and southwestern Montana. It also occurs in western Wyoming (Fig.). Shrubs are very sparse in this phase and undergrowths are usually depauperate. Normally Arnica cordifolia is the dominant forb. Brachythecium collinum is the most common moss and occasionally it creates a notable layer in this phase.

Timber productivity ranges from low to moderate (Appendix E-3) and is lowest in the Asmi phase. Pinus contorta is usually the most productive species and should establish easily where competing vegetation is removed. If P. contorta is absent, management of Picea or Pseudotsuga should be guided by natural patterns and frequency of regeneration observed in the stand. Domestic livestock and big game find little forage on these sites but use them for shelter or escape.

The Abla/Arco h.t. was previously described in Montana (Pfister and others, 1977) and central Idaho (Steele and others, 1975). It is also reported from the Bighorn Mountains of Wyoming (Hoffman and Alexander, 1976). Cooper's (1975) Abies lasiocarpa/Thalictrum occidentale h.t., Arnica cordifolia phase relates to our Abla/Arco h.t. and Henderson and others (1976) also record an Abla/Arco h.t.

G. PINUS ALBICAULIS SERIES

Pinus albicaulis h.t.s. extend downward from upper timberline on dried exposed ridges and southerly to westerly slopes. They are probably most common in the Wind River Range where Pinus albicaulis meets its southeastern limits but also extend northward through Yellowstone Park, Montana and Idaho. These sites are too severe for Abies or Picea and even the Pinus albicaulis is often deformed or stunted by wind, cold, or drought. This series borders alpine communities at its upper limits and merges with Abies lasiocarpa or Pinus contorta communities at lower elevations and on cooler aspects.

These h.t.s produce very little timber but may have high watershed values in some areas. Forage production may sustain light grazing but grazing abuse can easily decimate the forage and expose the soil. The vegetation recovers very slowly and, in some areas, soil loss can prevent complete restoration. These sites generally have low undergrowth that permit easy travel and the surrounding scenery has considerable aesthetic appeal. So recreationists seek these areas for hiking and camping but if these activities are concentrated they can easily disrupt soils and vegetation.

Some people have delineated h.t.s within the Pial series. Cooper (1975) and Reed (1976) discuss a Pinus albicaulis/Vaccinium scoparium h.t. within our study area. This h.t. also extends into Montana (Pfister and others 1977, Weaver and Dale, 1974) and occupies the moister portions of the Pinus albicaulis zone. Cooper (1975) also describes a Pinus albicaulis/Carex geyeri h.t. representing small topoedaphic conditions that appeared in numerous areas. Some sites that are very exposed to wind and sun support a Pinus albicaulis/Festuca idahoensis community. This condition appears in the Wind River Range and in Montana (Pfister and others, 1977).

The above studies suggest that there is considerable diversity within the Pinus albicaulis series. Until we obtain more data from these difficult-access areas we prefer not to subdivide h.t.s. within the Pinus albicaulis series. However, all of these conditions have little resource value and can be treated as a single unit for the practicalities of management.

H. PINUS CONTORTA SERIES

This series consists of essentially pure stands of Pinus contorta in which there is insufficient evidence to indicate that other species constitute the potential climax. The series is similar environmentally to the colder part of the Pseudotsuga series and the droughtier part of the Picea and Abies series.

Pinus contorta is a seral species throughout much of the northern Rocky Mountains. It often pioneers reforestation of severely disturbed sites and is often replaced by other conifers within one generation (Pfister and Daubenmire, 1975). In the study area, there appears a tendency, for P. contorta to be rapidly replaced on steeper slopes but more persistent on gentler terrain. In some broad high-elevation valleys it persists for many generations with little or no evidence of replacement by other conifers. Upper limits of these persistent P. contorta stands often resemble a contour and suggest a response to impoundment of cold air and possibly storage of sub-surface water. Slopes above such valleys have intermediate situations where P. contorta persists but is gradually replaced by Abies lasiocarpa and Pseudotsuga. P. contorta also dominates on some gentle slopes and benches near upper timberline, occasionally accompanied by minor amounts of Pinus albicaulie.

Pinus contorta is well adapted to cold air drainages as evidenced by its ability to invade sites near receding glaciers (Heuser, 1969). Over millenia, P. contorta seedlings have periodically invaded raw substrates of glacial alluvium and were subjected to intense daily insolation and nightly cold air accumulation and frost. Today, P. contorta still dominates floors of glacial-moraine valleys in Idaho and Wyoming in spite of other coniferous seed sources on adjacent uplands. Although Abies lasiocarpa and Picea engelmannii extend to upper timberline and easily replace P. contorta on steeper slopes, their tolerance to daily temperature extremes on these gentle valley floors appears less than that of P. contorta.

Pure P. contorta stands have often been attributed to fire, yet fire is a minor factor in the most persistent stands. Undergrowths in these valley bottoms are sparse and produce little fuel. Most of the fuel occurs on adjacent slopes and natural fires on the valley floor that did not ascend the slopes would be very unusual. Yet quite often only the valley bottom contains pure P. contorta and adjacent slopes are in advanced stages of succession to Abies and Pseudotsuga climax. Also, upper limits of the persistent P. contorta stands often resemble a contour rather than previous patterns of fire and many P. contorta cones in these areas are nonserotinous. Thus, in these areas there is little evidence for fire maintenance of stable P. contorta stands. In fact, those stands which appear closest to a P. contorta climax have the widest spaced trees, the least undergrowth, and the gentlest slopes - all of which are unfavorable to fir spread.

There are other areas, of course, that have experienced repeated burning. But those sites show evidence of fire and produce enough fuel to generate an effective burn.

Pinus contorta clearly dominates as a climax species in some areas. In the vicinity of West Yellowstone, Montana, Pfister and others (1977), and Cooper (1975) describes climax P. contorta stands growing in lake silts and obsidian sand on benchland with frequent summer frosts. This is defined as the Pinus contorta/Parshia tridentata h.t. Steele and others (L975) have also described climax Pinus contorta in the Pinus contorta/Festurn idahoensis h.t. in central Idaho. Hoffman and Alexander (1975) describe P. contorta/Acrtostaphylos uva-ursi and P. contorta/Vaccinium scoparium h.t.s. in the Bighorn Mountains of Wyoming. Reed (1976), recognized a P. contorta/Poa nervosa h.t. for the Wind River Mountains which he had not proposed in his thesis (Reed, 1969). In south-central Oregon, Franklin and Dyrness (1973) describe climax stands of P. contorta on pumice soils. These stands occur on nearly level areas in enclosed depressions that impound cold air at night. On the Colorado Front Range, Moir (1969) recognized a stable zone of P. contorta that relates to gentle undulating terrain rather than basin topography.

These studies illustrate that P. contorta can remain dominant on gentle terrain for many generations. The governing factors on these sites appear to be nightly cold air accumulation with frequent summer frost and droughty substrates, perhaps with fluctuating water tables. On these sites, P. contorta remains dominant by inability of other conifers to grow there rather than superior interspecific competition. These studies also point out that, although P. contorta typically forms seral stands which persist to various degrees, there are portions of its environmental spectrum where it attains climax status.

The following community types (c.t.s) represent situations in which Pinus contorta may be the only conifer on the site. On some sites this situation occurs only in initial stages of secondary succession and indications of the climax community are usually evident. On other sites, P. contorta is a more persistent dominant and produces ample regeneration. Here, determining habitat type is more tenuous and often requires thorough investigation of the site and adjacent sites. There are a large number of h.t.s among the Abies, Picea, and Pseudotsuga series that can support pure Pinus contorta stands when other seed sources are absent. However, such conditions can be handled within this classification. If mesic undergrowth indicator species are present, these stands can usually be assigned to the proper h.t. Other sites where climax status for P. contorta is suspect can be treated as c.t.s. From a practical standpoint, these c.t.s can be managed as if P. contorta were climax even though Pseudotsuga or Abies may eventually invade the stand. Although several conditions on gentle terrain are suspected, we are not yet prepared to delineate any sites in the study area as definite P. contorta climax. Further study will likely result in change of some c.t.s to h.t.s in the final analysis and publication.

Key to *Pinus contorta* Community Types

1. *Linnaea borealis* common.
   ABIES LASIOCARPA/LINNAEA BOREALIS H.T. (p.77)

1. *L. borealis* scarce 2

   2. *Vaccinium globulare* well represented.
      PINUS CONTORTA/VACCINIUM GLOBULARE C.T. (p.108)

   2. *V. globulare* poorly represented 3

      3. *Symphoricarpos albus* well represented.
         ABIES LASIOCARPA/SYMPHORICARPOS ALBUS H.T. (p.81)

      3. *S. albus* poorly represented 4

         4. *Thalictrum occidentale* well represented.
            ABIES LASIOCARPA/THALICTRUM OCCIDENTALE H.T. (p.83)

         4. *T. occidentale* poorly represented 5

            5. *Spiraea betulifolia* well represented.
               PINUS CONTORTA/SPIRAEA BETULIFOLIA C.T. (p.108)

            5. *S. betulifolia* poorly represented 6

               6. *Vaccinium scoparium* well represented.
                  PINUS CONTORTA/VACCINIUM SCOPARIUM C.T. (p.109)

               6. *V. scoparium* poorly represented 7

                  7. *Osmorhiza chilensis* or *O. depauperata* well represented either individually or collectively.
                     ABIES LASIOCARPA/OSMORHIZA CHILENSIS H.T. (p.91)

                  7. *O. chilensis* and *O. depauperata* poorly represented 8

                     8. *Calamagrostis rubescens* well represented.
                        PINUS CONTORTA/CALAMAGROSTIS RUBESCENS C.T. (p.109)

                     8. *C. rubescens* poorly represented 9

                        9. *Carex geyeri* well represented.
                           PINUS CONTORTA/CAREX GEYERI C.T. (p.110)

                        9. *C. geyeri* poorly represented 10

10. Berberis repens common or Pachistima myrsinites well represented.
ABIES LASIOCARPA/BERBERIS REPENS H.T. (p. 95)

10. B. repens scarce and P. myrsinites poorly represented 11

11. Juniperus communis well represented.
PINUS CONTORTA/JUNIPERUS COMMUNIS C.T. (p.110)

11. J. communis poorly represented 12

12. Pedicularis racemosa common.
ABIES LASIOCARPA/PEDICULARIS RACEMOSA H.T. (p. 99)

12. P. racemosa scarce 13

13. Arnica cordifolia, Astragalus miser, or Sheperdia canadensis well represented.
PINUS CONTORTA/ARNICA CORDIFOLIA C.T. (p.111)

13. Not as above; Carex rossii well represented or dominant.
PINUS CONTORTA/CAREX ROSSII C.T. (p.111)

Pinus contorta/Vaccinium globulare c.t.
(Pico/Vagl c.t.; lodgepole pine/tall huckleberry)

The Pico/Vagl c.t. is likely to occur from Yellowstone Park south to the Utah border, but is absent in the Lemhi, Beaverhead, and Wind River ranges. It may be found on moist slopes or, more likely, benches having northerly to easterly aspects.

Usually Vaccinium globulare dominates the undergrowth and is accompanied by Lonicera utahensis. Vaccinium scoparium or Calamagrostis rubescens may be well represented.

This c.t. should be rare and represent only initial stages of secondary succession on a Psme/Vagl or Abla/Vagl h.t. Inspection of adjacent sites with similar abiotic features should reveal the appropriate h.t. for the site in question. Pinus contorta is likely to be the most productive conifer for the site but, in the case of Abla/Vagl h.t., potentials of Pseudotsuga and Picea should not be overlooked.

Pinus contorta/Spiraea betulifolia c.t.
(Pico/Spbe c.t.; lodgepole pine/white spiraea)

The Pico/Spbe c.t. may occur from about Palisades Reservoir northward to Yellowstone Park. It may be found on various aspects of gentle slopes and benches near the contact of the Pseudotsuga and Abies zones.

Spiraea betulifolia usually dominates the undergrowth but it may be subordinant to Calamagrostis rubescens, especially at this successional stage.

This c.t. is apparently scarce and represents initial stages of secondary succession on the Abla/Spbe or Psme/Spbe h.t.s. Inspection of surrounding sites should indicate the climax potential. The appropriate h.t. description may be consulted for management implications although Pinus contorta is apt to be the most productive conifer in this case.

Pinus contorta/Vaccinium scoparium c.t.
(Pico/Vasc c.t.; lodgepole pine/grouse whortleberry)

In our study area, the Pico/Vasc c.t. appears mostly in western Wyoming. It can be found on a variety of slopes and aspects at mid to upper elevations of the Abies lasiocarpa zone.

A low cover of Vaccinium scoparium usually dominates the undergrowth. Other shrubs, if present, are usually sparse and well scattered. A few forbs such as Arnica and Lupinus are often present and Pinus albicaulis may be present.

Most Pico/Vasc c.t.s in our area occupy the Abla/Vasc h.t. But on gentle slopes and broad benches an occasional Pico/Vasc c.t. may appear so persistent as to suggest a P. contorta climax. Farther east in the Bighorn Mountains, Hoffman and Alexander (1976) have described a Pico/Vasc h.t. that strongly resembles our Pico/Vasc c.t. In either case Pinus contorta is the most suitable timber species and other management guidelines should follow those of the Abla/Vasc h.t.

Pinus contorta/Calamagrostis rubescens c.t.
(Pico/Caru c.t.; lodgepole pine/pinegrass)

The Pico/Caru c.t. occurs most often in the vicinity of Yellowstone Park but may occur southward to the Idaho-Utah border. It occupies various cool dry aspects having gentle to moderate relief.

Calamagrostis rubescens often dominates the undergrowth. Shrubs are usually sparse but may include Prunus, Berberis, Pachistima, Amelanchier, and Symphoricarpos oreophilus.

Depending on location, the Pico/Caru c.t. varies from a clearly seral to a persistent successional stage. It usually occupies either a Psme/Caru or Abla/Caru h.t. The more persistent Pico/Caru c.t.s are most apt to occur on the Abla/Caru h.t. But if Prunus, Berberis, or Symphoricarpos oreophilus are well represented, it is most likely a Psme/Caru h.t. Inspection of less disturbed sites nearby may also indicate which h.t. is appropriate. In either case, Pinus contorta should be the most productive timber tree for the site and management guidelines for the Abla/Caru h.t. would best apply.

Pinus contorta/Carex geyeri c.t.
(Pico/Cage c.t.; lodgepole pine/elksedge)

The Pico/Cage c.t. is most common on the granitic soils of central Idaho but may also appear in our area in small amounts. It usually occupies the cool dry aspects of relatively gentle terrain.

Normally Carex geyeri dominates a depauperate undergrowth that contains only a few forbs. Shrubs are seldom conspicuous.

Most Pico/Cage c.t.s occupy the Abla/Cage h.t. A few may also occur near the cool extreme of the Psme/Cage h.t. Sometimes a Pico/Cage c.t. appears so persistent as to suggest a P. contorta climax. In all cases, P. contorta is the most suitable timber species and management guidelines should follow those of the Abla/Cage h.t.

Pinus contorta/Juniperus communis c.t.
(Pico/Juco c.t.; lodgepole pine/common juniper)

This c.t. may appear in small amounts within the study area. It is most apt to occur on gentle benches or dry stream terraces that accumulate cold air.

Usually Juniperus communis is well represented but recent burns may have reduced its coverage. Sheperdia canadensis is usually present and often dominates the undergrowth. Arnica cordifolia usually dominates a depauperate forb layer.

Most Pico/Juco c.t.s occupy the Abla/Juco h.t., but an occasional stand may occur on the Psme/Juco h.t. Inspection of adjacent sites with less disturbance should indicate which climax tree would apply. Pinus contorta should be the easiest tree to regenerate but on some sites Pseudotsuga may be more productive. Also, productivity of P. contorta may be lower on the Psme/Juco h.t. In most cases management guidelines should conform to those for the Abla/Juco h.t.

Pinus contorta/Arnica cordifolia c.t.
(Pico/Arco c.t.; lodgepole pine/heartleaf arnica)

The Pico/Arco c.t. may be found in east central Idaho and from the Wind River Mountains southwestward to the Wasatch Range. The terrain is usually gentle. It can occupy various aspects at mid elevations of the forested zone.

Pure stands of Pinus contorta are most common but occasionally P. albicaulis or P. flexilis are also present. Arnica cordifolia usually dominates a depauperate undergrowth but occasionally Pyrola secunda has higher coverage. Antennaria racemosa, or Astragalus miser may also codominate in various amounts. In some areas, Shepherdia canadensis dominates the undergrowth.

Most Pico/Arco c.t.s occupy the Abla/Arco h.t. but an occasional stand may occupy the Psme/Arco h.t. The latter condition is apt to occur near the cold extreme of the Psme/Arco h.t. Pico/Arco c.t.s become increasingly stable southeastward through the Wind River Range. Near the southern tip of this range they bear some resemblence to a h.t. Pinus contorta should regenerate easily on most of these sites but productivities of Pseudotsuga or Picea may be higher in some areas. In most cases, management guidelines for the Abla/Arco h.t. should apply.

Pinus contorta/Carex rossii c.t.
(Pico/Caro c.t.; lodgepole pine/Ross sedge)

The Pico/Caro c.t. was found in the vicinity of Yellowstone Park and in the Wind River Range. It occupies very gentle terrain at mid elevations of the Abies lasiocarpa zone.

Fairly open stands of pure Pinus contorta dominate the site. Sometimes small Pinus albicaulis are also present. Undergrowths are very depauperate; Lupinus argenteus is usually the dominant forb and Carex rossii the most abundant graminoid. Coverages of other species are usually very low.

These sites resemble the Abla/Caro h.t. on the southern Sawtooth National Forest but no Pico/Caro c.t.s were found in that area. Nor was any Abla/Caro h.t. found in this area. The marked difference in distributions of these two conditions suggests that different environments are involved. Thus it is possible that Pico/Caro is a h.t.

Production of Pinus contorta is low to moderate and successful regeneration appears sporadic. Some stands have been selectively cut for posts and poles. This appears to be an appropriate use of the timber resource. Large herbivores find very little forage here but seek these sites for escape and shelter when feeding in adjacent grasslands.

I. POPULUS TREMULOIDES SERIES

Populus tremuloides dominates a variety of sites within the study area. It is relatively scarce in the Lemhi and Beaverhead Mtns. and in northern portions of the study area but becomes increasingly prevalent to the south and east. Its successional role varies from a rapidly seral species to persistently seral and even climax. The most apparent climax conditions are those stands that occur beyond the lower limits of conifers. These stands may occupy concave slopes of low hills and even occur in the Artemisia zone on basalt talus, lava tubes, boulder fields and other hospitable microsites.

Stands bordering coniferous forest are the most perplexing in terms of succession. The trees here are often quite vigorous and will quickly invade adjacent sites when the conifers are removed. These stands often contain an occasional conifer that is usually healthy but shows little sign of increasing its foothold in the stand. In seemingly pure Populus stands a diligent search sometimes reveals a few conifer seedlings that are healthy but damaged by rodents and grazing animals. On these sites it is questionable if conifers, although present, would ever replace Populus.

Within the zone of coniferous forest, Populus stands tend to become more clearly seral. Here they occupy sites where fire or logging has removed the conifers or where landslides have provided a fresh substrate. Conifers may reclaim these sites fairly rapidly but in some areas conifer establishment appears retarded by a lush development of seral forbs and graminoids. In these cases conifer establishment was sometimes confined to the raised microsites of fallen Populus logs.

Undergrowths in Populus stands vary considerably. In many cases the undergrowths resemble portions of adjacent communities. Where the Populus is obviously climax the undergrowth often relates to adjacent Symphoricarpos oreophilus/Artemisia tridentata communities and may form a Populus tremuloides/Symphoricarpos oreophilus association as described by Reed (1971). Within the forested zone, Populus stands may have undergrowths similar to those beneath conifers or may have a layer of forbs and graminoids that appears seral to undergrowths beneath adjacent conifers. Where Populus stands border the coniferous zone this same layer of forbs and graminoids appears more stable but even here some Populus undergrowths are becoming dominated by Calamagrostis rubescens, Symphoricarpos albus, and Pachistima myrsinites. Undergrowths in many Populus stands attract large herbivores, both wild and domestic, which create disturbance and make successional interpretation even more difficult.

As Cooper (1975) noted, results pertaining to Populus tremuloides communities in one area should not be extrapolated elsewhere. We endorse this recommendation until Populus tremuloides habitat types can be identified. A classification of these stands will require careful assessments of grazing history, forest history, impact of wildlife, and successional relationships of Populus with conifers.

J. MINOR VEGETATION TYPES

Although this classification attempts to cover most forest land in the study area, several situations that support trees were intentionally excluded.

On foothills near the southern end of the Lemhi and Lost River ranges, Juniperus osteosperma forms an extensive woodland. This community represents a northern extension of the pinyon-juniper zone which is common in the Great Basin. Attempts to classify pinyon-juniper habitat are in progress and may eventually include this outlying area.

In the Snake River Range and south of Island Park, Juniperus scopulorum occasionally appears in pur stands or may mix with Cercocarpus. These stands occur below the limits of Pseudotsuga and usually occupy south to southwest aspects. Similar conditions without Cercocarpus are reported in Montana (Pfister and others, 1977) but were not sampled. No effort has yet been made to classify J. scopulorum stands in the Pacific Northwest.

In southeastern Idaho, Acer grandidentatum creates a woodland between the Pseudotsuga series and sagebrush-grass communities. Some undergrowths of the Acer relate to Pseudotsuga h.t.s; others do not. These Acer woodlands are part of an extensive mountain shrub zone that is more common in Utah where classification of these sites should be initiated.

A few of the larger rivers and streams form floodplains where they encounter more gentle terrain. Here various proportions of Populus angustifolia, Betula occidentalis, Crataegus douglasii, Eleagnus commutata, Salix and certain other shrubs combine to form a series of bottomland communities. Sometimes conifers are weakly represented. Fluctuations in stream activity may continually alter water tables and cyclic floods can alter soil depths and substrate composition. For these reasons many riparian situations have unstable vegetative potential and do not conform to the "potential-climax" h.t. concept. However, an effort is underway on the Bridger-Teton National Forest to classify this vegetation at the community type level.

V. USE OF THE CLASSIFICATION

A. VALIDATION

This classification attempts to provide a natural stratification of forest lands in terms of vegetative response. It is designed to reflect the combined forces of the environment upon a given site and discounts the temporary alterations of disturbance. Although the actual environmental parameters of a vegetal unit are often unknown, the major importance of this classification lies in the knowledge of the relative positions of the vegetal units. As R. and J. Daubenmire (1968) have pointed out "that system may be considered the closest to a natural one that allows the most predictions about a unit from a mere knowledge of its position in the system." We feel that a natural system of classification, yields the greatest benefit to the widest range of applications for the longest periods of time.

This classification reflects the combined sampling efforts of Reed (1969), Cooper (1975), Henderson and others (1976) and selected data from Steele and others (1974, 1975) in addition to our own two field crews for one summer. These combined inputs have given us a relatively large sample. However, the study area is quite diverse and it has been difficult to coordinate the various studies because the individual investigators are now working in other areas. Users of this classification can provide valuable feedback for problem areas. Additional field sampling is scheduled for the summer of 1978 in order to finalize the classification.

B. USE OF HABITAT TYPES

Pfister (1976) has outlined potential values of habitat types in resource management. Perhaps the most important use is a land stratification systemdesignating land areas with approximately equivalent environments or biotic potentialproviding a tool for cataloging (1) research results, (2) administrative study results, (3) accumulated field observations, and (4) intuitive evaluations. The habitat type classification is a foundation upon which to base predictions of response to activities related to land and vegetation management. One caution, however, is that habitat types are <u>not</u> a panacea for all decision making or interpretations. Habitat types <u>will</u> <u>complement</u> soils surveys, recreation surveys, socio-economic analyses, hydrologic surveys, wildlife surveys, etc. in the development of more intensive land-management planning and practices.

Some of the current and potential uses of habitat types include:

1. Communication--provides a basic framework for conveying ideas pertaining to specific units of land in relation to their environment, vegetation, and function.

2. timber management--stratification of seed source, species selection for planting, cutting and regeneration methods, assessing relative timber productivity;

3. range and wildlife management--assessing relative forage production and habitat values for summer and winter range;

4. watershed--estimating relative precipitation, evapotranspiration and moisture handling characteristics;

5. recreation--assessing suitability for various types of recreational use, impacts of recreational use on the plant communities and sites, and aesthetic recovery rates following stand disturbances;

6. forest protection--categorization of fuel buildup, fuel management, and the natural role of fire (frequency and intensity of burns); assessment of susceptibility to various insects and diseases;

7. natural area preservation--help insure that the environmental spectrum is adequately represented in research natural areas;

8. research--stratification tool for designing studies; reporting results in a format suitable for appropriate extrapolation.

Some management implications are discussed in the descriptions of the habitat types in this report. The Appendix data can provide additional implications through interpretation by appropriate functional specialists. Field personnel can also document repeated observations to help expand our knowledge of vegetative reactions on specific habitat types.

C. VEGETATION

1. Ecologic Roles of Plant Species

Most plant species theoretically distribute themselves independently along environmental gradients. However, many of these species express different ecological roles in different segments of their distribution. A single species can be either dominant or subordinant, climax or seral in response to different conditions. Thus a species' value as an ecological indicator depends on its position along the gradient being considered and the relative position of its associates. Relative ecological expressions of important species in the study area are presented in several ways.

The occurrence and roles of tree species (Appendix A) reflects the relative amplitude and successional status of our timber species in the various h.t.s and phases. This chart provides some of the basic information needed to select and manage the tree species best adapted to a given segment of the forest environment.

The constancy and average coverage data (Appendix B) portray the relative amplitude of major forest species and degree of dominance through the spectrum of forest h.t.s. Comparison of h.t.s using these data from mature stands provides insight to the h.t. classification that is not available in the keys or written descriptions. These tables also condense the vegetal information of each h.t. and reduce the need for elaborate vegetative descriptions.

2. Timber Productivity

Timber productivity is one of the key management implications for which data were collected during this study. Site trees were selected to determine the potential height growth of relatively free-growing trees. One site tree of each species was selected for each stand wherever possible. Site trees showing marked diameter-growth suppression for a period of 20 or more years were rejected during analysis of the increment cores. Old-growth and stagnated trees were not used for productivity estimation. Even though only a single site tree per species per stand was used, the data are reasonable consistent and comparisons of productivity among habitat types as well as within each habitat type.

Determination of site index from height-age data requires specific procedure for each tree species. The number of years to reach breast height (4.5 feet) must be measured or estimated for species having height-total age site curves. If a site curve is not available, a curve from another species must be selected as a substitute. Criteria used to determine total age, as well as sources of site index curves and yield capability data for this analysis, are summarized in table 2.

Table 2.--Criteria and sources for determining site index and for estimating yield capability.

Tree Species	Estimated years to obtain breast height	Source of site curve[1]	Yield capability (all trees - fig. 8)
PIPO	10	Lynch 1958	Brickell 1970
PSME	10	- - - - - - Used PIPO curves - - - - - -	
PICO	10	Alexander 1966	Used LAOC curve[2]
PICEA	([3])	Alexander 1967	Alexander[4]
ABLA	([3])	- - - - - Used PICEA curves - - - - - -	
PIAL	([3])	- - - - - Used PICEA curves - - - - - -	
PIFL	([3])	- - - - - Used PICEA curves - - - - - -	

1/ All site curves with a 100-year index age were converted to a 50-year index age.

2/ Brickell's (1970) curves for PICO and LAOC (trees larger than 5.0 inches) were nearly identical. A new curve (based on all trees) was developed for LAOC from yield data in Schmidt and others (1976). The LAOC curve for all trees appears to be as accurate as any available for estimating PICO yield capability for all trees.

3/ Curves based on age at breast height were used.

4/ Data used in a recent yield study (Alexander and others 1975) were provided by Alexander. Site index and mean annual increment from 21 fully-stocked natural stands were used to develop the curve shown in figure 8. (Yield capability = -26.0 + 1.84 Site Index (50); $R^2 = 0.66$).

We used Pinus ponderosa curves for determining Pseudotsuga site index rather than Brickell's (1968) Pseudotsuga curves, because the curve shapes for Pinus ponderosa are more realistic for our data (giving closer estimates for different aged site trees in the same stand). Furthermore, since Pinus ponderosa yield tables are currently used to estimate Pseudotsuga hields in the Northern Rocky Mountains, it is more logical to use Pinus ponderosa site index for estimating Pseudotsuga yields.

We used Alexander's (1967) Picea engelmannii curves for Picea rather than Brickell's (1966) because: (1) Alexander's are based on breast-height age (data available) rather than total age (estimate required); (2) the curve shapes are more realistic for our data (giving closer estimates for different aged site trees in the same stand); and (3) yield data related to the curves are available (Alexander and others 1975). We also used Alexander's (1967) Picea engelmannii curves for several other species that lack site-index curves; because they do not require breast-height age estimates. Thus a possible source of estimation error is eliminated.

The site-index data (base age 50 years) have been summarized by species within habitat types (Appendix C-1). The mean site index was calculated whenever three or more values were available. With five or more values, a 95-percent confidence interval for estimation of the true population mean was calculated. (The confidence interval narrows with both decreased variability and increased sample size.) The same procedure was used for summarizing basal areas of sample stands.

Although site productivity can be compared by using site index alone, a more useful assessment can be made by using the estimated net yield capability of the site (cubic-foot production). Until managed-stand yield tables are completed, the best approach is to use natural-stand yield tables for assessing yield capability. As stated by Brickell (1970), "Yield capability, as used by Forest Survey, is defined as mean annual increment of growing stock attainable in fully stocked natural stands at the age of culmination of mean annual increment:. (In other words, yield capability = maximum mean annual increment attainable in fully stocked natural stands.)

The curves used to estimate yield capability from site index are presented in Appendix C-2. Yield capability values are based on cubic feet of all trees (>0.5 inch d.b.h.). The Larix occidentalis curve was derived from Schmidt and others (1976). (Brickell's 1970 curve for this species was only for trees greater than 5.0 inches in diameter.) The Larix curve was also used for Pinus contorta because Brickell's (1970) curves (trees >5.0 inches) are almost identical for the two species, and because natural stand yield data have not been published for Pinus contorta.

The Picea curve was derived from original data used in developing managed-stand yield tables (Alexander and others 1975). We calculated mean annual increment for all trees for 21 of Alexander's fully stocked natural stands near the age of culmination of mean annual increment (ages from 97 to 165 years). A linear regression of yield capability on Alexander's (1967) site index was conducted, converted to site index at base-age 50, and plotted in figure 48. [Yield Capability = -26.0 + (1.84 X 50-year site index) $R^2 = 0.66$]. The other curves were developed by Brickell (1970) from natural-stand yield tables.

The spread in these curves indicates that natural-stand yield capability for a given site index varies by species. This illustrates the importance of using species-specific curves for estimating productivity.

Our best current estimates of yield capability (in cubic feet/acre/year) for each habitat type are shown in Appendix C-3. Procedures used to develop these estimates were:

1. Yield capability was estimated for each site tree from appropriate species curves according to the criteria in table 2. These values were plotted by species within habitat types and phases for a visual display of distribution.

2. Mean yield capability for all site trees in each habitat type was calculated and cutoff points were established to approximate 90 percent of the range of our data.

3. For habitat types where stockability appears to limit productivity, a stockability factor was developed. Basal area data for plots in these types were compared with Meyer's (1938) basal area data for fully stocked "normal" stands, following the approach of MacLean and Bolsinger (1973). From these calculations and additional observations, an average mean stockability factor was determined for several habitat types. This factor was multiplied by yield capability for a given site index to determine the adjusted yield capability. A factor of ± 0.10 was used to expand the estimated range of productivity for these habitat types.

These current best estimates (Appendix C-3) portray both relative productivity of habitat types and the range of productivity within a habitat type. From these, it is possible to assign a ranking or qualitative rating of potential timber productivity of natural stands for use in planning.

As Daubenmire (1976) emphasized, natural vegetation serves as a convenient indicator of productivity over large areas of land. However, productivity within habitat types (Appendix C-3) often shows substantial variability. The following points help explain this variability, and give suggestions for reducing it.

1. Site-index curves were used to obtain productivity data from yield tables. Different height-growth patterns undoubtedly occur on different sites, but data to account for this variation are not available.

2. Yield tables and site curves have not been developed for all species, making extrapolation necessary.

3. Yields of mixed species stands can be estimated by several individual species' yield tables. We found that a range in yield capability was common in individual stands, depending upon the specied used for estimation.

4. Some variability in productivity within a habitat type is logical in a natural classification system. The habitat type classification system. The habitat type classification is based on abilities of species to reproduce and mature under competition, not on their rates of growth. The correlation between this and productivity is imperfect. (For instance, in some stands tree roots draw on underground water tables and achieve excellent growth rates, while surface drought limits development of tree seedlings and undergrowth.)

5. Where a more accurate estimate of productivity is needed for local areas, we recommend taking additional site-index samples.

6. It has been suggested that productivity estimates for habitat types could be improved by incorporating classifications of soils, topography, or climate. Differences in productivity within a habitat type due to topography or soils are apparent in some local areas. However, because of the limitations of existing site index curves and yield tables, further refinement of productivity data for large areas should be based on more precise methods of measuring productivity.

7. Natural-stand yield capability by habitat type could be estimated more precisely by direct measurements of volume growth, rather than by using site index to enter a yield table based on averages. This would require analysis of existing timber inventory plots representing maximum growth potential or new field measurements.

8. Recent stand growth models (Stage 1973, 1975) utilize growth coefficients based on habitat types. These add a new dimension to yield prediction, provide the basis for developing managed-stand yield tables, and should eventually improve our knowledge of productivity within and between habitat types.

D. MAPPING

Habitat type maps have become an important management tool in the Northern Rocky Mountains (Deitschman, 1973; Layser, 1974; Stage and Alley, 1973; Daubenmire, 1973; USDA Forest Service, 1973). They provide a permanent record of habitat type distribution on the landscape, provide a basis for acreage estimates for land-use planning, and serve as a basic reference for many management activities.

Maps may be made at various scales and degrees of accuracy, depending upon objectives. For research studies, project planning, etc., maps should be accurate and detailed; each phase of a habitat type should be delineated, especially for research studies. The map scale should range from 4 to 8 inches per mile. At a broader level of planning (multiple use planning unit, National Forests, etc) map accuracy and detail may decrease and mapping efforts may be extensive. Habitat types are often the finest subdivisions shown, and map scale can range from 1 to 2 inches per mile.

Selecting a mapping approach and appropriate scale to produce an acceptable map must be based on the following: (1) anticipated use of the map, (2) accuracy level required, (3) availability of adequately trained personnel, and (4) amount of time and financial support available to achieve the specified accuracy level.

At scales of 4 to 8 inches per mile, the habitat types or phases are useful as basic mapping units, acceptine inclusions (up to 15 percent) of other types too small to map separately. In complex topography and at smaller map scales, special mapping units must be developed, which may be called complexes or mosaics. Such mapping-unit complexes must be defined for each area being mapped, rather than on a preconceived grouping. The amount and relative positions of habitat types and phases within a complex must be specified because the management interpretations of a mapping unit are tied to the taxonomic units--series, habitat type, and phase.

Regardless of the mapping scale used, the field reconnaissance should identify stands to the phase level. The amount and location of field reconnaissance should also be specified on the map or in a report for users of the map. Finally, the map accuracy should be estimated and checked to maintain quality control in application of the habitat type classification.

D. ZONAL RELATIONSHIPS AND GEOGRAPHIC DISTRIBUTION

Just as individual species occur in a predictable sequence with changing environments, h.t.s. also create predictable patterns in local areas. On a larger scale, the sequence of h.t.s. will vary through additions or omissions but their relative positions should remain constant. Thus Pseudotsuga h.t.s. normally occur in warmer and drier environments than Abies lasiocarpa h.t.s. but Abies grandis h.t.s. may occur between the two series or may be absent. This rule applies to patterns of individual h.t.s. and phases as well as series.

Schematic diagrams (figs. 38-41) are presented for characteristic localities in order to demonstrate the relative positions of eastern Idaho-western Wyoming key species and h.t.s. These diagrams are not literally accurate because of the difficulty of depicting a three dimensional landscape in two dimensions. However, they are an attempt to portray the relative relationships between all major habitat types in a given vicinity. On a specific mountsinside as few as half of the types depicted for a general vicinity may be present. The diagrams also illustrate the criteria used in defining the classification units.

For each diagram, species are displayed in the order usually encountered with increasing elevation (from left to right). The ends of the horizontal bars depict the lower and upper limits of the species. That portion of the tree species range where it is considered. Climax is indicated by a broader line. That portion of an undergrowth species range where it is used to define a habitat type or phase is also indicated by a broader line.

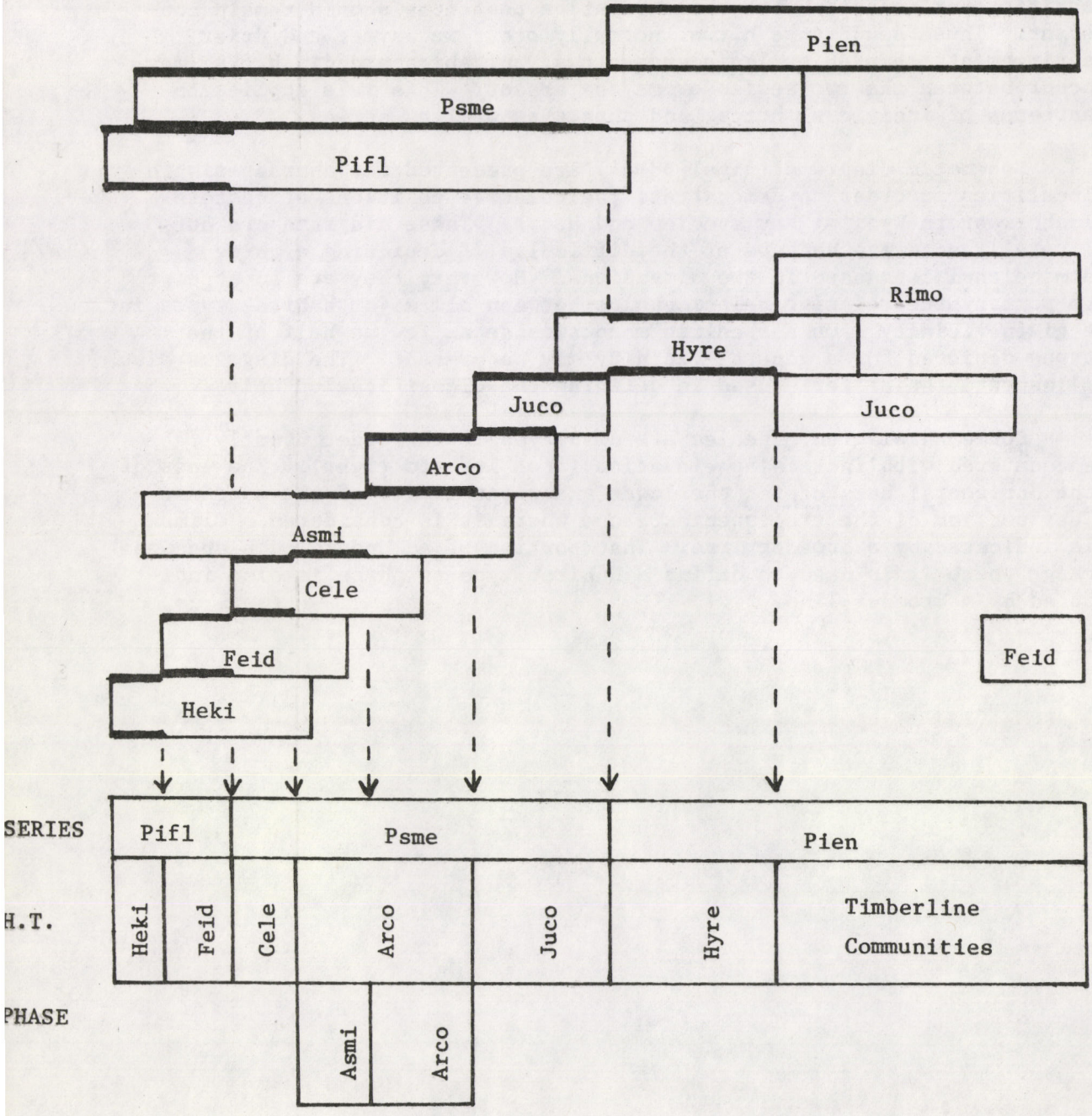


Figure 38.--General relationship of forest vegetation near Blue Dome, Idaho.

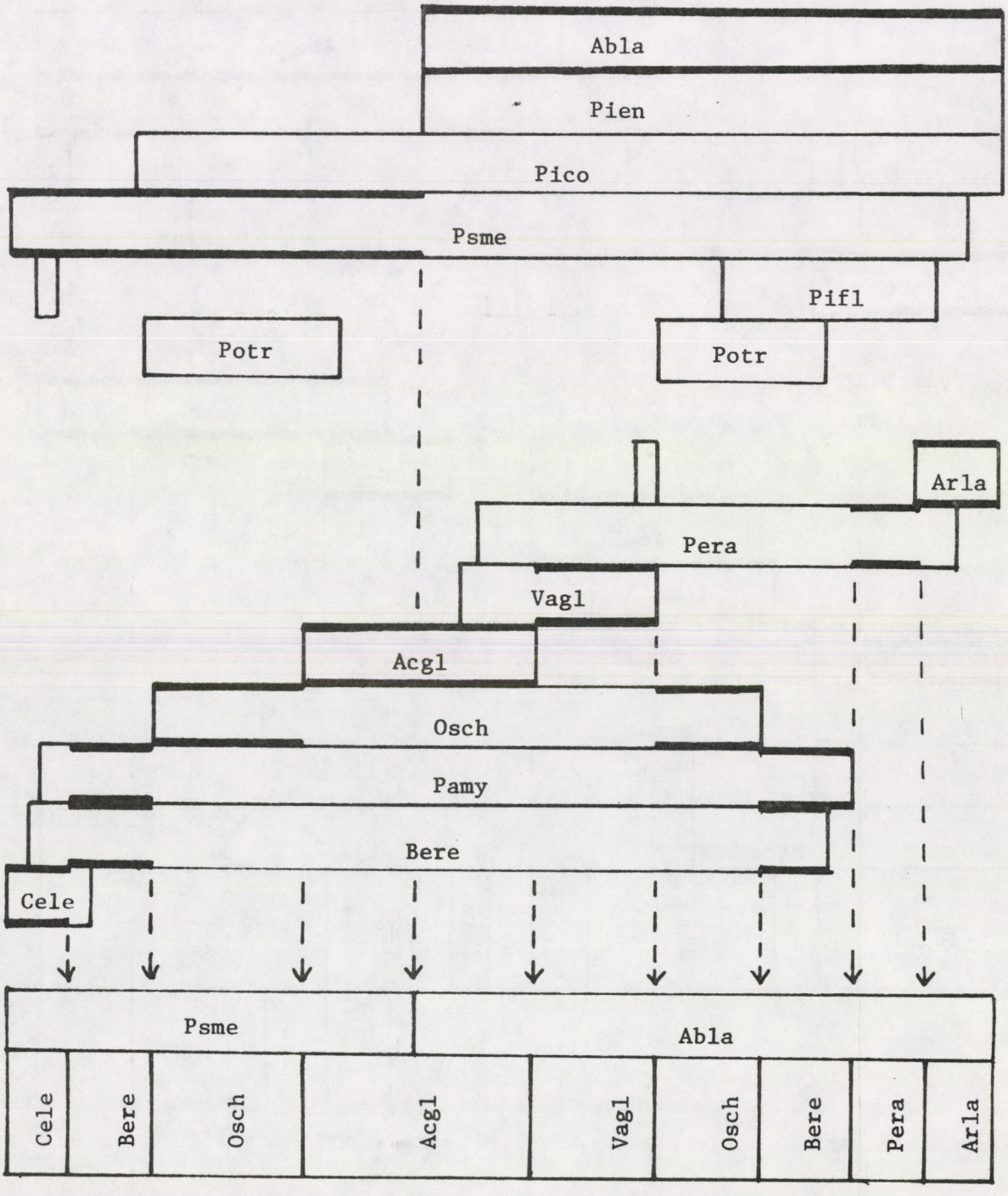


Figure 39.--General relationship of forest vegetation near Soda Springs, Idaho.

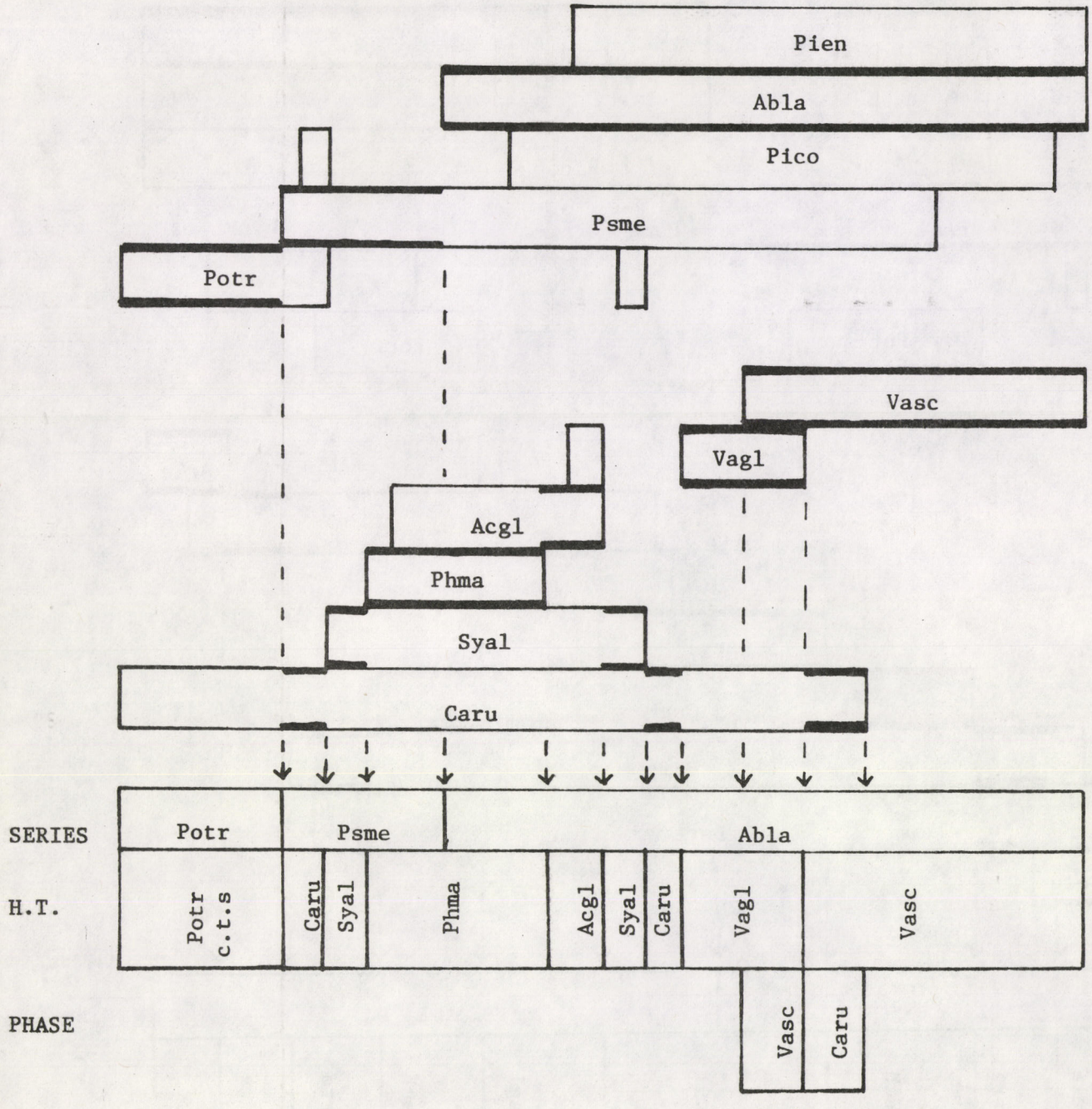


Figure 40.--General relationship of forest vegetation near Alpine, Wyoming.

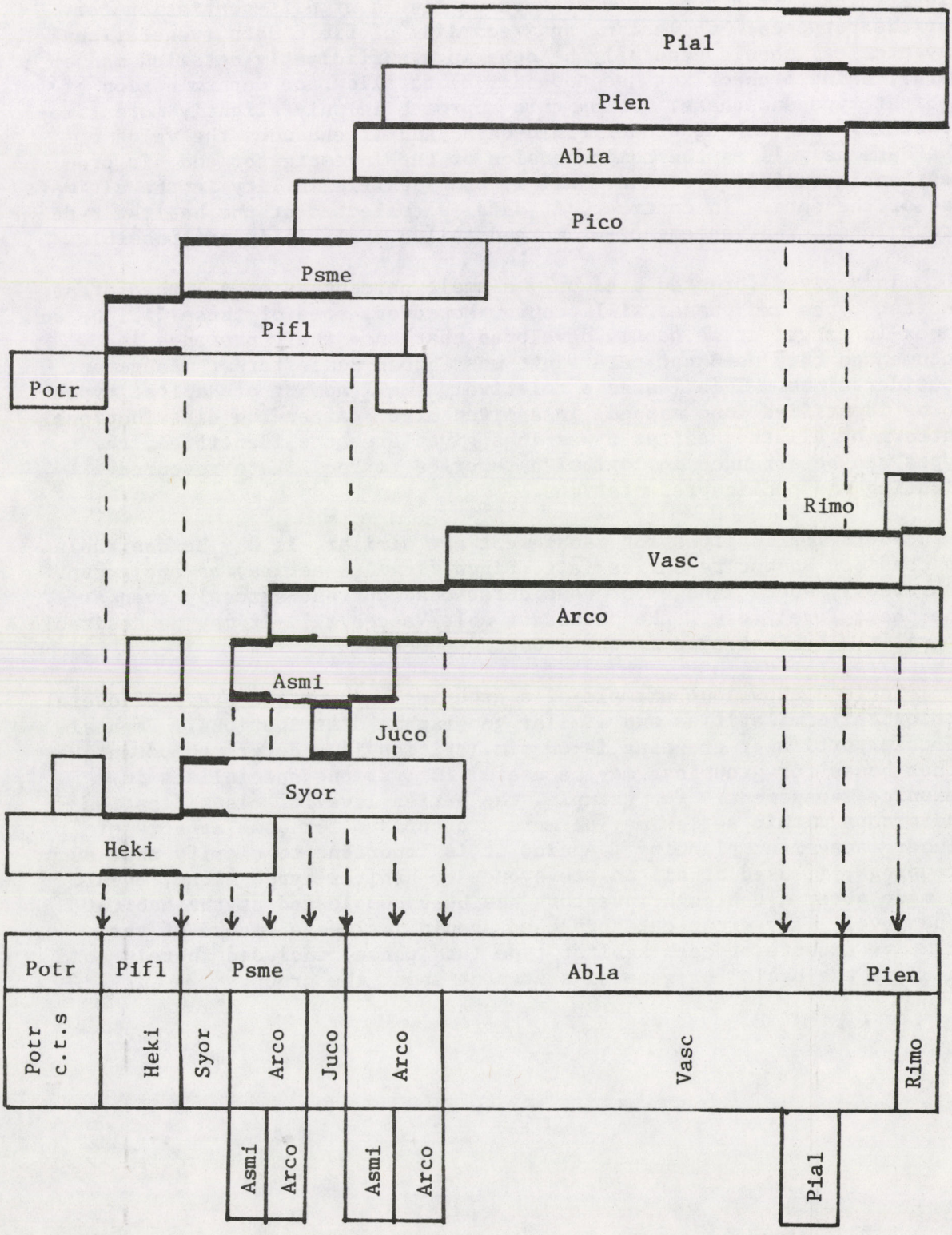


Figure 41.--General relationship of forest vegetation near Pinedale, Wyoming.

E. GROUPING

Since this classification system for potential vegetation is hierarchical, it can be used at various levels of differentiation for various purposes. Collecting and recording of field data (vegetational inventories) should generally be done in a sufficiently detailed manner (e.g., using a checklist, as Appendix D) to allow for determination of habitat type and phase. Using this approach is only slightly more time-consuming than taking cruder field-data, and it enhances the value of the data as well as the comprehension of the investigator and his professional credibility. Above all it provides flexibility in the ultimate use of the data. In contrast, if data is collected at the habitat type group level, rearrangement, or more-detailed analysis is not possible.

In a given forested area only a small percentage of all the forest habitat types and phases will occur. Moreover, some of these will be so minor in extent or so poorly developed that once their presence is documented they need not enter into most broad scale forest management considerations. This leaves a relatively small number of habitat types to be identified (and mapped) in a given area. After the distributional pattern of all the habitat types in a given area are identified, the types can be arranged in logical categories to facilitate resource planning and public presentations.

Where implications for management are similar, it may be desirable to consider an entire series (e.g. Pinus flexilis series) as one group. Conversely, where management considerations contrast strongly even at the phase level (e.g., the phases of Abla/Vasc h.t.), it may be desirable to split a habitat type in the grouping process.

Table 3 shows one example of a grouping made on the basis of overall ecological similarities and similar geographic distributions. Emphasis in this particular grouping is on similarities in undergrowth potential. Other bases for groupings may be useful for various specialists in resource management. For example, the series level of classification and groups within series may be more appropriate for some aspects of timber management planning. Again, it is important to clarify that such groupings, if used at all in preference to habitat types alone, should be made after a thorough inventory has been complested at the habitat type level. Any group category used should include a record of the relative amounts of each habitat type (and phase) included therein to document the basis for general statement about the group.

Table 3.--An example of habitat type grouping based upon similarities in ecology and geographic distribution with emphasis on undergrowth vegetation potential.

Groups:

1. Pinus flexilis series, Psme/Cele h.t., Psme/Syor h.t.

2. Psme/Phma h.t., Psme/Acgl h.t. Pamy phase, Abla/Phma h.t., Abla/Acgl h.t., Abla/Acru h.t.

3. Psme/Vagl h.t., Abla/Vagl h.t., Pamy phase

4. Psme/Syal h.t., Psme/Spbe h.t. Spbe phase, Abla/Syal h.t., Abla/Spbe h.t.

5. Psme/Spbe h.t. Caru phase, Psme/Caru h.t. Caru phase, Abla/Caru h.t. Caru phase

6. Psme/Caru h.t. Pamy phase, Abla/Caru h.t. Pamy phase

7. Psme/Osch h.t., Abla/Osch h.t.

8. Psme/Juco h.t., Psme/Arco h.t., Abla/Juco h.t., Abla/Arco h.t.

9. Psme/Bere, Abla/Bere

10. Abla/Vagl h.t. Vasc phase, Abla/Vasc h.t. Vasc phase

11. Abla/Vasc h.t. Pial phase, Pial Series

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APPENDIX

The following tables and figures have been grouped in an appendix for convenient reference. This does not mean the materials included are less important.

Appendix A can be used as an aid in h.t. identification and as a reference for evaluating tree species distribution and interrelationships.

Appendix B provides the foundation for the classification, the average composition of mature stands in each type, and a wealth of information on distribution of individual species.

Appendix C provides the current available information on potential timber productivity for the h.t.s.

Appendix D is an essential tool for learning to use the classification correctly and a convenient means of documenting identification for new stands.

Appendix A. Occurrence and Roles of Tree Species by Habitat Types

Occurrence of tree species by habitat type showing their successional status as interpreted from eastern Idaho and western Wyoming reconnaissance plot data.

C = major climax species S = major seral species a = accidental
C = minor climax species s = minor seral species ( ) = only in central areas of h.t.

Habitat Type Phase	Potr	Pifl	Psme	Pico	Pipu	Pien	Abla	Pial
Pifl/Cele		C	C					
Pifl/Heki		C	C					
Psme/Phma	s	s	C				a	
Psme/Acgl-Pamy	(S)	(s)	C	(S)			a	
/Acgl-Syor		s	C			a		
Psme/Vagl			C	S				
Psme/Syal	(S)	s	C	(S)	a			
Psme/Spbe-Caru	(s)	a	C	(S)				a
/Spbe-Spbe	(s)	(s)	C	(S)			a	
Psme/Osch	S		C	(s)			a	
Psme/Caru-Pamy	(s)	a	C	(S)			a	
/Caru-Caru	(S)	a	C	(S)			a	
Psme/Juco	a	(s)	C				a	a
Psme/Cele		(c)	C	a				
Psme/Bere	(s)	(s)	C	(s)			a	
Psme/Arco-Arco	a	a	C	(S)		a	a	a
/Arco-Asmi	a	s	C	a		a		
Psme/Syor	a	(s)	C	a				a
Pien/Eqar			a	s	(C)	(C)	c	
Pien/Gatr			a	s	(C)	(C)	c	
Pien/Vasc		(s)		S		C	a	(s)
Pien/Hyre		s	C	(s)		C		
Pien/Rimo				S		C		S
Abla/Acru	a		s	s	a	S	C	a
Abla/Phma	(s)	a	S	a		s	C	
Abla/Acgl		a	S	(s)		s	C	
Abla/Libo-Vasc		a	(s)	S		S	C	a
/Libo-Libo	(s)		(s)	S		S	C	a
Abla/Vagl-Vasc			(s)	S		S	C	(s)
/Vagl-Pamy	(s)	a	s	S		S	C	a
Abla/Syal	(S)	a	S	S		S	C	
Abla/Thoc		a	(S)	s		S	C	a
Abla/Spbe			S	S		s	C	a
Abla/Vasc-Caru	a		s	S		a	C	a
/Vasc-Pial			a	S		s	C	C
/Vasc-Vasc		a	(s)	S		S	C	s
Abla/Arla	(S)	a	(s)	S		S	C	(S)
Abla/Osch-Pamy	(S)	(s)	S	s		s	C	
/Osch-Osch	(S)		(s)	(S)		a	C	
Abla/Caru-Pamy	(s)	a	S	(S)		(s)	C	
/Caru-Caru	(s)	a	(S)	S		(s)	C	a
Abla/Bere	(S)	(s)	S	(S)		(S)	C	a
Abla/Rimo	a	(s)	(s)	(s)		S	C	(s)
Abla/Pera		a	(S)	S		S	C	(s)
Abla/Arco-Asmi	(s)	s	(S)	S		(S)	C	
/Arco-Arco	(s)	a	S	S		S	C	(s)

Appendix B. Constancy and (Average Coverage %) of Important Plants in Habitat Types and Phases of Eastern Idaho and Western Wyoming.

Code Number	Series	PINUS FLEXILIS		PSEUDOTSUGA MENZIESII								
	Habitat Type	CELE	HEKI	CELE	BERE	ARCO		SYOR	JUCO	CARU		OSCH
	Phase					ARCO	ASMI			CARU	PAMY	
	No. of Stands	n = 3	n = 8	n = 10	n = 20	n = 31	n = 9	n = 24	n = 19	n = 27	n = 10	n = 18
	TREES											
001	Abies grandis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
002	Abies lasiocarpa	-(0)	-(0)	-(0)	1(0)	1(3)	-(0)	-(0)	1(3)	1(1)	1(1)	3(2)
006	Larix occidentalis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
007	Picea engelmannii	-(0)	-(0)	-(0)	-(0)	1(2)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)
022	Picea pungens	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
009	Pinus albicaulis	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	+(3)	1(3)	-(0)	-(0)	-(0)
010	Pinus contorta	-(0)	-(0)	1(3)	1(26)	2(14)	1(0)	1(1)	2(11)	4(16)	2(19)	1(3)
011	Pinus flexilis	10(36)	10(15)	3(13)	2(1)	1(2)	6(8)	2(4)	5(9)	1(8)	1(1)	-(0)
013	Pinus ponderosa	-(0)	-(0)	-(0)	1(15)	-(0)	-(0)	1(9)	-(0)	-(0)	-(0)	1(85)
014	Populus tremuloides	-(0)	-(0)	-(0)	1(15)	1(1)	1(3)	1(1)	1(9)	+(63)	3(2)	4(27)
016	Pseudotsuga menziesii	10(17)	10(38)	10(17)	10(62)	10(56)	10(49)	10(44)	10(55)	10(55)	10(65)	10(68)
	SHRUBS AND SUBSHRUBS											
102	Acer glabrum	-(0)	-(0)	2(3)	5(2)	2(4)	1(0)	1(1)	2(1)	+(0)	7(3)	3(1)
167	Acer grandidentatum	-(0)	-(0)	1(3)	1(1)	-(0)	-(0)	-(0)	-(0)	+(3)	-(0)	1(2)
104	Alnus sinuata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
105	Amelanchier alnifolia	7(1)	-(0)	2(2)	9(4)	1(5)	-(0)	3(1)	1(2)	3(5)	9(6)	7(9)
201	Arctostaphylos uva-ursi	-(0)	-(0)	-(0)	-(0)	+(0)	-(0)	-(0)	1(0)	+(3)	-(0)	-(0)
150	Artemisia tridentata	10(1)	5(1)	4(8)	1(1)	2(0)	3(1)	7(7)	2(10)	2(3)	1(0)	-(0)
203	Berberis repens	7(3)	1(1)	7(5)	10(18)	3(1)	1(1)	4(1)	3(6)	6(1)	9(17)	7(7)
107	Ceanothus velutinus	3(1)	-(0)	-(0)	2(1)	-(0)	-(0)	+(3)	-(0)	-(0)	2(1)	-(0)
173	Cercocarpus ledifolius	10(32)	6(1)	10(43)	+(1)	1(0)	1(1)	1(2)	-(0)	-(0)	-(0)	-(0)
149	Rhamnus purshiana	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
204	Clematis columbiana	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(5)	-(0)	1(1)
205	Gaultheria humifusa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
112	Juniperus communis	-(0)	4(0)	2(0)	2(0)	5(2)	3(0)	3(2)	10(24)	1(8)	1(1)	-(0)
113	Ledum glandulosum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
206	Linnaea borealis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
154	Loncera caerulea	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
115	Loncera utahensis	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	1(1)	+(1)	2(3)	-(0)
116	Menziesia ferruginea	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)
118	Pachistima myrsinites	3(1)	1(1)	3(2)	7(22)	1(1)	1(1)	+(3)	1(3)	2(1)	10(38)	2(19)
122	Physocarpus malvaceus	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	+(1)	-(0)	-(0)	1(1)	1(3)
124	Prunus virginiana	-(0)	1(0)	4(8)	6(24)	1(0)	1(3)	3(2)	1(1)	3(6)	7(7)	4(10)
125	Purshia tridentata	-(0)	3(2)	-(0)	1(1)	-(0)	-(0)	2(2)	1(8)	-(0)	-(0)	-(0)
128	Ribes cereum	3(1)	5(0)	3(6)	1(1)	3(3)	4(1)	6(4)	3(7)	+(1)	-(0)	1(1)
158	Ribes hudsonianum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
130	Ribes lacustre	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
159	Ribes montigenum	3(1)	3(0)	1(1)	1(0)	1(1)	2(2)	-(0)	1(2)	+(1)	-(0)	1(3)
131	Ribes viscosissimum	-(0)	-(0)	-(0)	2(0)	2(1)	1(1)	+(1)	2(1)	1(2)	4(1)	1(1)
132	Rosa acicularis	-(0)	1(0)	-(0)	1(1)	1(2)	-(0)	-(0)	1(0)	+(1)	-(0)	-(0)
133	Rosa gymnocarpa	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
161	Rosa nutkana	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	3(1)	-(0)
134	Rosa woodsii	-(0)	1(1)	-(0)	2(0)	1(1)	-(0)	2(5)	-(0)	1(1)	1(1)	-(0)
136	Rubus parviflorus	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
139	Sheperdia canadensis	-(0)	1(1)	-(0)	3(2)	3(4)	4(1)	-(0)	5(4)	+(3)	2(1)	-(0)
140	Sorbus scopulina	-(0)	-(0)	-(0)	2(2)	-(0)	-(0)	-(0)	-(0)	+(1)	4(1)	2(6)
142	Spiraea betulifolia	-(0)	-(0)	-(0)	-(0)	+(3)	-(0)	+(3)	2(1)	3(2)	1(3)	1(1)
162	Spiraea pyramidata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
143	Symphoricarpos albus	-(0)	-(0)	2(3)	1(3)	-(0)	-(0)	-(0)	-(0)	2(3)	-(0)	1(1)
163	Symphoricarpos oreophilus	10(2)	6(1)	7(19)	9(15)	9(11)	8(5)	10(22)	9(10)	6(9)	10(10)	8(9)
145	Vaccinium caespitosum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
146	Vaccinium globulare	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)
148	Vaccinium scoparium	-(0)	-(0)	-(0)	-(0)	+(0)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)
	FERN ALLIES											
254	Equisetum arvensis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
	GRAMINOIDS											
301	Agropyron spicatum	7(2)	6(15)	10(26)	1(1)	2(0)	6(1)	8(11)	1(1)	+(1)	1(15)	-(0)
304	Bromus vulgaris	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)
305	Calamagrosis canadensis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
307	Calamagrostis rubescens	-(0)	-(0)	-(0)	4(2)	1(3)	-(0)	+(3)	1(0)	10(56)	10(36)	7(11)
308	Carex conncinoides	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)	-(0)	-(0)
339	Carex disperma	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
309	Carex geyeri	-(0)	-(0)	-(0)	3(4)	2(3)	-(0)	2(2)	2(1)	4(13)	2(1)	6(11)
311	Carex rossii	7(1)	8(2)	6(1)	5(0)	4(1)	3(1)	5(2)	5(2)	1(1)	2(1)	5(1)
316	Elymus glaucus	-(0)	1(3)	-(0)	-(0)	1(3)	-(0)	1(1)	1(37)	2(8)	1(1)	1(2)
317	Festuca idahoensis	3(1)	6(2)	1(3)	1(1)	6(5)	6(9)	3(3)	3(2)	1(2)	-(0)	1(1)
348	Hesperochloa kingii	10(2)	10(25)	5(5)	1(1)	3(1)	4(1)	1(8)	3(0)	-(0)	-(0)	-(0)
322	Juncus parryi	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
323	Koeleria cristata	3(1)	1(3)	1(1)	-(0)	-(0)	-(0)	1(2)	-(0)	-(0)	-(0)	-(0)
325	Luzula hitchcockii	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
349	Melica bulbosa	3(1)	-(0)	1(1)	-(0)	-(0)	-(0)	2(1)	1(1)	+(1)	-(0)	-(0)
329	Oryzopsis asperifolia	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
331	Poa nervosa	-(0)	3(3)	2(2)	4(1)	7(6)	8(3)	4(6)	5(5)	4(1)	1(3)	3(3)
360	Stipa occidentalis	-(0)	-(0)	1(1)	-(0)	+(15)	2(2)	+(1)	-(0)	1(1)	-(0)	-(0)

Code to constancy values: + = 0-5% 1 = 5-15% 2 = 15-25% 3 = 25-35% 4 = 35-45% 5 = 45-55% 6 = 55-65%
7 = 65-75% 8 = 75-85% 9 = 85-95% 10 = 95-100% (Canopy coverage expressed to nearest %)

Appendix B. Cont.

Code Number	Series / Habitat Type / Phase / No. of Stands	PINUS FLEXILIS CELE n = 3	PINUS FLEXILIS HEKI n = 8	PSEUDOTSUGA MENZIESII CELE n = 10	PSEUDOTSUGA MENZIESII BERE n = 20	PSEUDOTSUGA MENZIESII ARCO n = 31	PSEUDOTSUGA MENZIESII ARCO ASMI n = 9	PSEUDOTSUGA MENZIESII SYOR n = 24	PSEUDOTSUGA MENZIESII JUCO n = 19	PSEUDOTSUGA MENZIESII CARU CARU n = 27	PSEUDOTSUGA MENZIESII CARU PAMY n = 10	PSEUDOTSUGA MENZIESII OSCH n = 18
	FORBS											
401	Achillaea millefolium	3(3)	5(2)	7(1)	3(1)	1(0)	4(4)	5(1)	3(1)	8(1)	2(1)	5(1)
402	Actaea rubra	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
565	Aconitum columbianum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
403	Adenocaulon bicolor	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
738	Antennaria corymbosa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
414	Antennaria microphylla	3(1)	6(2)	4(1)	1(1)	4(2)	8(13)	5(2)	4(2)	3(1)	1(1)	1(1)
413	Antennaria racemosa	-(0)	-(0)	-(0)	-(0)	2(7)	-(0)	+(1)	2(18)	2(2)	-(0)	-(0)
754	Aquilegia coerulea	-(0)	-(0)	-(0)	2(1)	-(0)	2(2)	-(0)	1(1)	+(1)	1(1)	1(1)
577	Arenaria aculeata	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
420	Arenaria macrophylla	-(0)	-(0)	-(0)	2(1)	-(0)	-(0)	-(0)	-(0)	-(0)	2(2)	2(21)
421	Arnica cordifolia	-(0)	1(1)	1(37)	6(22)	10(20)	6(2)	3(1)	8(11)	9(13)	9(9)	5(19)
422	Arnica latifolia	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
426	Aster conspicuus	-(0)	-(0)	-(0)	1(1)	+(37)	1(3)	-(0)	-(0)	+(37)	-(0)	1(1)
582	Aster engelmannii	3(3)	-(0)	-(0)	1(1)	+(1)	-(0)	1(1)	-(0)	3(3)	3(5)	1(2)
430	Astragalus miser	-(0)	6(17)	-(0)	-(0)	2(14)	10(32)	1(2)	1(15)	5(11)	-(0)	1(3)
431	Balsamorhiza sagitatta	6(3)	6(7)	8(5)	3(1)	2(0)	1(1)	2(5)	1(1)	1(1)	1(3)	2(2)
696	Caltha biflora	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
741	Castilleja covilleana	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
438	Castilleja miniata	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	1(1)	+(1)	2(2)	-(0)
595	Chaenactis douglasii	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)
442	Chimaphila umbellata	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	2(2)	-(0)
447	Clintonia uniflora	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
449	Coptis occidentalis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
602	Crepis accuminata	3(1)	6(4)	6(4)	1(3)	1(0)	-(0)	4(1)	1(0)	1(1)	1(3)	-(0)
458	Dodecatheon jeffreyi	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
455	Disporum trachycarpum	-(0)	-(0)	-(0)	2(1)	+(1)	1(1)	-(0)	1(3)	1(2)	2(0)	3(1)
459	Epilobium angustifolium	-(0)	-(0)	-(0)	2(0)	2(1)	-(0)	+(1)	2(1)	3(3)	1(1)	-(0)
465	Fragaria vesca	-(0)	1(1)	-(0)	4(2)	-(0)	1(1)	2(1)	1(1)	6(3)	5(4)	3(7)
466	Fragaria virginiana	-(0)	-(0)	-(0)	-(0)	1(8)	1(15)	+(1)	-(0)	2(3)	-(0)	-(0)
471	Galium triflorum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)
620	Geranium richardsonii	-(0)	-(0)	-(0)	1(15)	1(1)	-(0)	1(2)	-(0)	1(2)	1(1)	-(0)
473	Geranium viscosissimum	-(0)	-(0)	-(0)	3(1)	+(1)	-(0)	1(1)	1(1)	6(3)	1(3)	4(1)
474	Geum triflorum	-(0)	1(3)	1(1)	-(0)	2(1)	2(1)	1(1)	2(1)	1(1)	-(0)	-(0)
476	Goodyera oblongifolia	-(0)	-(0)	-(0)	1(0)	-(0)	-(0)	-(0)	-(0)	1(1)	3(1)	1(1)
484	Hieracium albiflorum	-(0)	-(0)	-(0)	2(0)	-(0)	-(0)	1(1)	-(0)	1(1)	3(1)	1(1)
486	Hieracium gracile	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
489	Ligusticum canbyi	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
756	Ligusticum filicinum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)
490	Ligusticum tenuifolium	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
497	Lomatium dissectum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	2(0)	-(0)	-(0)	-(0)	-(0)
641	Lupinus argenteus	-(0)	3(1)	-(0)	-(0)	+(1)	-(0)	+(1)	1(1)	3(3)	1(1)	2(1)
642	Lupinus polyphyllus	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
649	Mitella pentandra	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
502	Mitella stauropetala	-(0)	1(1)	-(0)	3(1)	-(0)	-(0)	-(0)	-(0)	1(1)	4(5)	4(2)
505	Osmorhiza chilensis	-(0)	-(0)	-(0)	5(1)	1(1)	-(0)	+(1)	1(1)	3(1)	5(1)	7(31)
653	Osmorhiza depauperata	-(0)	-(0)	-(0)	1(1)	+(1)	-(0)	1(1)	-(0)	2(1)	-(0)	3(37)
507	Pedicularis bracteosa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)
509	Pedicularis racemosa	3(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
514	Penstemon wilcoxii	-(0)	-(0)	-(0)	1(2)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)
663	Phacelia hastata	-(0)	-(0)	1(1)	1(1)	-(0)	-(0)	3(1)	-(0)	-(0)	-(0)	-(0)
669	Potentilla diversifolia	-(0)	1(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
521	Potentilla flabellifolia	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
670	Potentilla gracilis	-(0)	-(0)	-(0)	-(0)	1(2)	2(1)	-(0)	-(0)	1(2)	-(0)	1(1)
526	Pyrola asarifolia	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
529	Pyrola secunda	-(0)	-(0)	-(0)	2(1)	2(2)	1(1)	-(0)	2(1)	1(1)	4(0)	1(1)
676	Saxifraga arguta	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
538	Senecio pseudaureus	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
681	Senecio streptanthifolius	3(1)	3(2)	4(2)	1(1)	5(1)	7(1)	3(1)	5(4)	2(2)	1(3)	1(1)
539	Senecio triangularis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
542	Smilacina racemosa	-(0)	-(0)	3(1)	6(2)	1(2)	-(0)	3(3)	1(1)	2(1)	7(8)	7(1)
543	Smilacina stellata	-(0)	-(0)	-(0)	1(1)	+(3)	-(0)	1(0)	-(0)	1(1)	-(0)	-(0)
684	Solidago multiradiata	-(0)	-(0)	3(1)	-(0)	3(1)	1(3)	+(3)	3(5)	1(1)	-(0)	-(0)
546	Streptopus amplexifolius	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
714	Thalictrum fendleri	-(0)	-(0)	1(0)	2(1)	+(1)	-(0)	+(1)	-(0)	1(5)	2(1)	4(3)
547	Thalictrum occidentale	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	+(3)	-(0)	3(2)	6(6)	1(2)
560	Trillium ovatum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
690	Trollius laxus	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
551	Valeriana sitchensis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)
552	Veratrum viride	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)	-(0)	-(0)
554	Viola adunca	-(0)	-(0)	-(0)	3(1)	+(0)	-(0)	-(0)	-(0)	1(1)	5(1)	3(1)
555	Viola canadensis	-(0)	-(0)	-(0)	-(0)	+(3)	-(0)	-(0)	-(0)	+(3)	-(0)	-(0)
693	Viola nuttallii	-(0)	-(0)	1(1)	2(1)	-(0)	-(0)	1(1)	-(0)	2(1)	-(0)	6(1)
557	Viola orbiculata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
694	Viola purpurea	-(0)	-(0)	2(0)	1(1)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)
558	Xerophyllum tenax	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)

Appendix B. Cont.

Code Number	Series / Habitat Type / Phase / No. of Stands	PSEUDOTSUGA MENZIESII PHMA n = 14	ACGL PAMY n = 10	ACGL SYOR n = 7	VAGL n = 5	SYAL n = 14	SPBE SPBE n = 12	SPBE CARU n = 11	PICEA ENGELMANNII EQAR n = 10	GATR n = 4	VASC n = 8	HYRE n = 6	RIMO n = 2
	TREES												
001	Abies grandis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
002	Abies lasiocarpa	1(0)	3(1)	-(0)	-(0)	-(0)	1(1)	-(0)	6(12)	5(9)	1(3)	-(0)	-(0)
006	Larix occidentalis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
007	Picea engelmannii	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	9(59)	8(78)	10(33)	10(23)	10(26)
022	Picea pungens	-(0)	-(0)	-(0)	-(0)	1(2)	-(0)	-(0)	1(37)	3(98)	-(0)	-(0)	-(0)
009	Pinus albicaulis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(15)	-(0)	-(0)	3(50)	-(0)	10(31)
010	Pinus contorta	-(0)	2(15)	-(0)	8(26)	1(8)	3(11)	2(15)	4(5)	3(15)	8(34)	2(3)	5(63)
011	Pinus flexilis	3(5)	3(1)	7(4)	-(0)	3(9)	3(10)	1(1)	-(0)	-(0)	4(13)	8(4)	-(0)
013	Pinus ponderosa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
014	Populus tremuloides	1(3)	3(22)	-(0)	-(0)	2(25)	1(3)	2(2)	-(0)	-(0)	-(0)	-(0)	-(0)
016	Pseudotsuga menziesii	10(59)	10(64)	10(67)	10(43)	10(53)	10(62)	10(68)	1(1)	-(0)	-(0)	10(58)	-(0)
	SHRUBS AND SUBSHRUBS												
102	Acer glabrum	6(8)	10(31)	10(13)	-(0)	4(1)	3(5)	5(2)	-(0)	3(1)	-(0)	2(1)	-(0)
167	Acer grandidentatum	1(8)	2(1)	-(0)	-(0)	1(19)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)
104	Alnus sinuata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
105	Amelanchier alnifolia	6(6)	7(15)	4(5)	8(11)	6(10)	5(9)	5(10)	2(1)	5(1)	-(0)	-(0)	-(0)
201	Arctostaphylos uva-ursi	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	2(1)	-(0)
150	Artemisia tridentata	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	1(0)	-(0)	-(0)	-(0)	-(0)	-(0)
203	Berberis repens	8(8)	8(3)	3(15)	2(1)	9(4)	8(8)	7(5)	-(0)	-(0)	-(0)	-(0)	-(0)
107	Ceanothus velutinus	-(0)	1(1)	-(0)	-(0)	1(1)	1(3)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)
173	Cercocarpus ledifolius	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
149	Rhamnus purshiana	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
204	Clematis columbiana	3(5)	6(6)	1(37)	6(6)	1(1)	-(0)	2(1)	-(0)	5(1)	-(0)	-(0)	-(0)
205	Gaultheria humifusa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
112	Juniperus communis	1(2)	-(0)	6(2)	-(0)	4(4)	3(5)	2(2)	1(1)	3(3)	3(2)	5(3)	-(0)
113	Ledum glandulosum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(3)	-(0)	-(0)	-(0)	-(0)
206	Linnaea borealis	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	2(9)	3(3)	-(0)	-(0)	-(0)
154	Lonicera caerulea	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
115	Lonicera utahensis	4(4)	4(8)	-(0)	10(10)	1(2)	2(2)	5(1)	3(1)	8(1)	-(0)	-(0)	-(0)
116	Menziesia ferruginea	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
118	Pachistima myrsinites	9(13)	8(9)	-(0)	4(2)	4(4)	4(16)	5(21)	-(0)	5(2)	-(0)	-(0)	-(0)
122	Physocarpus malvaceus	10(56)	1(3)	-(0)	2(0)	1(1)	1(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)
124	Prunus virginiana	6(8)	4(11)	3(20)	-(0)	7(13)	4(15)	5(8)	-(0)	-(0)	-(0)	-(0)	-(0)
125	Purshia tridentata	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
128	Ribes cereum	-(0)	-(0)	10(5)	-(0)	-(0)	3(1)	-(0)	1(1)	-(0)	-(0)	2(1)	-(0)
158	Ribes hudsonianum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	2(0)	3(1)	-(0)	-(0)	-(0)
130	Ribes lacustre	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	9(5)	10(20)	-(0)	-(0)	-(0)
159	Ribes montigenum	-(0)	-(0)	1(1)	-(0)	-(0)	2(1)	1(0)	-(0)	-(0)	3(0)	3(8)	10(9)
131	Ribes viscosissimum	-(0)	3(1)	1(1)	4(3)	1(1)	2(1)	2(1)	-(0)	-(0)	-(0)	2(1)	-(0)
132	Rosa acicularis	-(0)	-(0)	-(0)	2(3)	1(15)	-(0)	-(0)	1(3)	3(15)	-(0)	-(0)	-(0)
133	Rosa gymnocarpa	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)
161	Rosa nutkana	1(1)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	3(3)	-(0)	-(0)	-(0)
134	Rosa woodsii	1(3)	-(0)	-(0)	-(0)	1(2)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
136	Rubus parviflorus	1(15)	2(2)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	3(1)	-(0)	-(0)	-(0)
139	Sheperdia canadensis	1(1)	2(8)	6(13)	2(1)	1(2)	4(1)	1(15)	4(1)	-(0)	-(0)	7(2)	-(0)
140	Sorbus scopulina	1(0)	5(7)	-(0)	10(7)	1(3)	2(8)	4(1)	-(0)	3(1)	-(0)	-(0)	-(0)
142	Spiraea betulifolia	6(12)	6(31)	1(3)	10(24)	8(35)	10(36)	10(25)	-(0)	-(0)	-(0)	-(0)	-(0)
162	Spiraea pyramidata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
143	Symphoricarpos albus	6(6)	3(30)	1(0)	4(15)	10(22)	3(2)	2(3)	1(1)	-(0)	-(0)	-(0)	-(0)
163	Symphoricarpos oreophilus	4(5)	5(2)	9(13)	-(0)	-(0)	7(6)	5(4)	-(0)	-(0)	-(0)	7(1)	-(0)
145	Vaccinium caespitosum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
146	Vaccinium globulare	-(0)	2(39)	-(0)	10(48)	-(0)	-(0)	1(3)	1(1)	-(0)	-(0)	-(0)	-(0)
148	Vaccinium scoparium	-(0)	-(0)	-(0)	4(8)	-(0)	-(0)	-(0)	3(1)	3(15)	10(47)	-(0)	5(1)
	FERN ALLIES												
254	Equisetum arvensis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	10(73)	5(2)	-(0)	-(0)	-(0)
	GRAMINOIDS												
301	Agropyron spicatum	3(2)	-(0)	4(1)	-(0)	4(5)	4(7)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)
304	Bromus vulgaris	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(3)	3(1)	-(0)	-(0)	-(0)
305	Calamagrostis canadensis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	5(8)	-(0)	-(0)	-(0)	-(0)
307	Calamagrostis rubescens	8(6)	8(25)	-(0)	8(12)	6(24)	4(3)	9(42)	-(0)	3(15)	-(0)	-(0)	-(0)
308	Carex conncinoides	1(3)	-(0)	-(0)	-(0)	1(3)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
339	Carex disperma	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	7(6)	-(0)	-(0)	-(0)	-(0)
309	Carex geyeri	2(5)	6(9)	1(15)	8(9)	1(2)	3(2)	6(35)	-(0)	-(0)	-(0)	-(0)	-(0)
311	Carex rossii	4(1)	1(1)	1(1)	4(2)	4(2)	1(3)	3(1)	-(0)	-(0)	6(2)	2(1)	-(0)
316	Elymus glaucus	4(1)	4(1)	-(0)	2(3)	1(1)	3(2)	4(2)	3(1)	5(3)	-(0)	-(0)	-(0)
317	Festuca idahoensis	-(0)	-(0)	-(0)	-(0)	4(6)	2(2)	-(0)	-(0)	-(0)	1(0)	3(1)	-(0)
348	Hesperochloa kingii	2(1)	-(0)	6(1)	-(0)	1(3)	1(1)	-(0)	-(0)	-(0)	-(0)	2(1)	-(0)
322	Juncus parryi	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
323	Koeleria cristata	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
325	Luzula hitchcockii	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)
349	Melica bulbosa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
329	Oryzopsis asperifolia	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
331	Poa nervosa	5(3)	1(3)	6(4)	-(0)	4(5)	8(3)	5(2)	-(0)	-(0)	6(4)	2(1)	10(8)
360	Stipa occidentalis	1(1)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)

Code to constancy values: + = 0-5% 1 = 5-15% 2 = 15-25% 3 = 25-35% 4 = 35-45% 5 = 45-55% 6 = 55-65% 7 = 65-75%
8 = 75-85% 9 = 85-95% 10 = 95-100% (Canopy coverage expressed to nearest %)

Appendix B. Cont.

Code Number	Series / Habitat Type / Phase / No. of Stands	PSEUDOTSUGA MENZIESII PHMA n = 14	ACGL PAMY n = 10	ACGL SYOR n = 7	VAGL n = 5	SYAL n = 14	SPBE SPBE n = 12	SPBE CARU n = 11	PICEA ENGELMANNII EQAR n = 10	EQAR n = 4	GATR n = 8	VASC n = 6	HYRE n = 2	RIMO
	FORBS													
401	Achillaea millefolium	4(1)	-(0)	1(1)	-(0)	6(1)	5(1)	3(1)	2(1)	-(0)	3(1)	2(1)	10(2)	
402	Actaea rubra	1(1)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	6(4)	10(5)	-(0)	-(0)	-(0)	
565	Aconitum columbianum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	4(5)	3(1)	-(0)	-(0)	-(0)	
403	Adenocaulon bicolor	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
738	Antennaria corymbosa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
414	Antennaria microphylla	1(1)	-(0)	4(1)	-(0)	3(1)	2(2)	1(1)	-(0)	-(0)	8(1)	3(1)	5(1)	
413	Antennaria racemosa	-(0)	2(1(	-(0)	-(0)	-(0)	3(2)	1(3)	-(0)	-(0)	-(0)	-(0)	-(0)	
754	Aquilegia coerulea	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(3)	5(1)	3(1)	-(0)	5(1)	
577	Arenaria aculeata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
420	Arenaria macrophylla	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
421	Arnica cordifolia	6(10)	8(11)	6(19)	8(12)	3(8)	6(8)	9(9)	3(7)	5(8)	9(3)	8(1)	10(9)	
422	Arnica latifolia	-(0)	1(3)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
426	Aster conspicuus	1(1)	2(9)	-(0)	-(0)	1(9)	1(15)	1(3)	-(0)	3(15)	-(0)	-(0)	-(0)	
582	Aster engelmannii	1(3)	4(1)	-(0)	6(1)	2(1)	2(20)	6(2)	1(3)	-(0)	-(0)	-(0)	-(0)	
430	Astragalus miser	1(26)	1(15)	1(63)	-(0)	3(8)	4(7)	2(8)	-(0)	-(0)	1(3)	3(1)	-(0)	
431	Balsamorhiza sagitatta	1(8)	-(0)	3(8)	-(0)	4(16)	4(7)	3(1)	-(0)	-(0)	-(0)	-(0)	-(0)	
696	Caltha biflora	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
741	Castilleja covilleana	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
438	Castilleja miniata	1(1)	-(0)	4(1)	-(0)	-(0)	2(1)	1(1)	2(1)	-(0)	-(0)	-(0)	-(0)	
595	Chaenactis douglasii	-(0)	-(0)	1(1(	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
442	Chimaphila umbellata	-(0)	2(1)	-(0)	6(2)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
447	Clintonia uniflora	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
449	Coptis occidentalis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
602	Crepis accuminata	-(0)	-(0)	-(0)	-(0)	4(1)	2(8)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
458	Dodecatheon jeffreyi	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
455	Disporum trachycarpum	4(3)	9(2)	1(1)	6(5)	2(6)	5(1)	2(2)	2(0)	5(2)	-(0)	-(0)	-(0)	
459	Epilobium angustifolium	3(1)	3(1)	1(1)	4(3)	3(1)	3(1)	-(0)	7(3)	5(1)	4(1)	3(1)	5(3)	
465	Fragaria vesca	7(3)	4(2)	-(0)	4(1)	1(15)	3(6)	4(4)	4(1)	8(1)	1(1)	-(0)	-(0)	
466	Fragaria virginiana	1(2)	-(0)	-(0)	4(2)	3(5)	3(2)	-(0)	5(7)	-(0)	-(0)	-(0)	5(1)	
471	Galium triflorum	2(1)	7(1)	1(3)	2(1)	-(0)	1(1)	1(3)	6(15)	3(3)	-(0)	-(0)	-(0)	
620	Geranium richardsonii	1(1)	2(1)	-(0)	2(1)	1(15)	1(1)	1(3)	4(5)	5(1)	1(15)	-(0)	-(0)	
473	Geranium viscosissimum	1(2)	-(0)	-(0)	2(1)	4(1)	3(1)	3(2)	2(8)	-(0)	1(1)	-(0)	-(0)	
474	Geum triflorum	1(1)	-(0)	3(1)	-(0)	2(1)	2(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
476	Goodyera oblongifolia	4(1)	3(1)	-(0)	6(1)	1(1)	1(1)	3(1)	-(0)	-(0)	-(0)	-(0)	-(0)	
484	Hieracium albiflorum	1(2)	1(1)	1(1)	8(2)	1(0)	-(0)	2(3)	-(0)	-(0)	-(0)	-(0)	-(0)	
486	Hieracium gracile	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
489	Ligusticum canbyi	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
756	Ligusticum filicinum	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	
490	Ligusticum tenuifolium	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
497	Lomatium dissectum	-(0)	-(0)	-(0)	-(0)	1(1)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
641	Lupinus argenteus	-(0)	-(0)	-(0)	-(0)	2(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
642	Lupinus polyphyllus	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
649	Mitella pentandra	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	6(9)	-(0)	-(0)	-(0)	-(0)	
502	Mitella stauropetala	3(5)	4(5)	-(0)	-(0)	-(0)	-(0)	-(0)	1(15)	5(1)	-(0)	-(0)	-(0)	
505	Osmorhiza chilensis	3(1)	3(6)	1(15)	8(3)	2(1)	4(7)	8(3)	3(3)	-(0)	1(3)	-(0)	-(0)	
653	Osmorhiza depauperata	-(0)	7(21)	-(0)	-(0)	1(1)	1(1)	-(0)	4(1)	5(1)	1(1)	-(0)	-(0)	
507	Pedicularis bracteosa	-(0)	2(1)	-(0)	-(0)	-(0)	-(0)	2(2)	1(1)	-(0)	4(0)	-(0)	5(1)	
509	Pedicularis racemosa	1(1)	-(0)	-(0)	2(1)	-(0)	-(0)	1(3)	-(0)	3(1)	1(1)	-(0)	-(0)	
514	Penstemon wilcoxii	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
663	Phacelia hastata	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
669	Potentilla diversifolia	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	5(1)	-(0)	10(2)	
521	Potentilla flabellifolia	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(3)	-(0)	-(0)	-(0)	-(0)	
670	Potentilla gracilis	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	2(2)	-(0)	-(0)	-(0)	-(0)	
526	Pyrola asarifolia	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	5(4)	3(3)	-(0)	-(0)	-(0)	
529	Pyrola secunda	1(3)	5(1)	3(8)	8(2)	-(0)	1(1)	3(2)	8(3)	10(1)	1(3)	7(1)	-(0)	
676	Saxifraga arguta	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	7(16)	-(0)	-(0)	-(0)	-(0)	
538	Senecio pseudaureus	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	
681	Senecio streptanthifolius	2(1)	-(0)	9(1)	-(0)	2(2)	2(2)	2(2)	-(0)	-(0)	-(0)	5(1)	-(0)	
539	Senecio triangularis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	7(12)	5(1)	-(0)	-(0)	-(0)	
542	Smilacina racemosa	8(3)	9(1)	3(2)	2(1)	7(1)	4(2)	5(4)	1(3)	3(1)	-(0)	-(0)	-(0)	
543	Smilacina stellata	1(1)	-(0)	1(15)	-(0)	1(1)	-(0)	-(0)	5(15)	8(22)	-(0)	-(0)	-(0)	
684	Solidago multiradiata	1(2)	-(0)	-(0)	-(0)	1(15)	2(1)	2(2)	1(1)	-(0)	3(2)	-(0)	5(1)	
546	Streptopus amplexifolius	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	4(8)	3(3)	-(0)	-(0)	-(0)	
714	Thalictrum fendleri	4(8)	6(4)	-(0)	2(3)	4(11)	1(15)	2(8)	3(1)	-(0)	-(0)	-(0)	-(0)	
547	Thalictrum occidentale	1(2)	-(0)	-(0)	6(18)	1(2)	3(26)	5(11)	1(1)	5(8)	-(0)	-(0)	-(0)	
560	Trillium ovatum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
690	Trollius laxus	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	2(20)	-(0)	1(0)	-(0)	-(0)	
551	Valeriana sitchensis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
552	Veratrum viride	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
554	Viola adunca	6(1)	5(1)	-(0)	-(0)	1(1)	1(1)	-(0)	1(1)	3(1)	-(0)	-(0)	-(0)	
555	Viola canadensis	1(3)	2(2)	-(0)	2(1)	1(1)	2(2)	3(1)	1(3)	-(0)	-(0)	-(0)	-(0)	
693	Viola nuttallii	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	
557	Viola orbiculata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	
694	Viola purpurea	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	
558	Xerophyllum tenax	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	

Appendix B. Cont.

Code Number	Series: ABIES LASIOCARPA	ACRU	PHMA	ACGL	LIBO		VAGL		SYAL	THOC	SPBE	OSCH	
	Habitat Type				LIBO	VASC	PAMY	VASC				PAMY	OSCH
	Phase												
	No. of Stands	n = 14	n = 8	n = 10	n = 9	n = 12	n = 33	n = 16	n = 11	n = 15	n = 18	n = 6	n = 7
	TREES												
001	Abies grandis	-(0)	-(0)	-(0)	-(0)	1(15)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
002	Abies lasiocarpa	10(24)	10(25)	10(20)	10(8)	10(15)	10(26)	10(28)	10(23)	10(30)	10(28)	10(21)	10(35)
006	Larix occidentalis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
007	Picea engelmannii	10(32)	6(7)	8(10)	10(43)	8(35)	7(15)	9(32)	6(15)	7(20)	4(11)	7(15)	1(0)
022	Picea pungens	1(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
009	Pinus albicaulis	1(3)	-(0)	-(0)	2(8)	3(1)	2(8)	4(6)	-(0)	3(2)	1(1)	-(0)	-(0)
010	Pinus contorta	6(9)	1(3)	3(23)	8(20)	9(35)	8(32)	8(22)	7(21)	6(12)	8(19)	3(9)	4(27)
011	Pinus flexilis	-(0)	1(15)	1(0)	-(0)	1(15)	1(1)	-(0)	3(0)	1(1)	-(0)	3(15)	-(0)
013	Pinus ponderosa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(3)	-(0)	-(0)
014	Populus tremuloides	1(3)	1(37)	-(0)	1(63)	-(0)	+(15)	-(0)	3(26)	1(26)	-(0)	3(37)	4(49)
016	Pseudotsuga menziesii	4(20)	10(53)	9(41)	3(10)	3(13)	8(15)	3(7)	8(23)	5(33)	8(42)	8(28)	3(26)
	SHRUBS AND SUBSHRUBS												
102	Acer glabrum	3(8)	10(8)	10(23)	-(0)	-(0)	1(1)	-(0)	2(2)	-(0)	3(2)	5(2)	1(1)
167	Acer grandidentatum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)
104	Alnus sinuata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
105	Amelanchier alnifolia	4(1)	9(7)	9(8)	1(1)	-(0)	6(8)	4(4)	10(9)	2(1)	7(5)	3(1)	3(2)
201	Arctostaphylos uva-ursi	-(0)	-(0)	-(0)	1(1)	2(9)	-(0)	-(0)	2(2)	-(0)	-(0)	-(0)	-(0)
150	Artemisia tridentata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
203	Berberis repens	4(2)	6(4)	5(1)	6(3)	2(9)	2(1)	1(1)	6(4)	5(3)	7(2)	3(1)	7(13)
107	Ceanothus velutinus	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(2)	-(0)	1(0)
173	Cercocarpus ledifolius	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
149	Rhamnus purshiana	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
204	Clematis columbiana	1(8)	9(4)	4(4)	1(0)	-(0)	1(1)	-(0)	3(13)	2(3)	3(3)	2(1)	-(0)
205	Gaultheria humifusa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
112	Juniperus communis	1(2)	4(1)	-(0)	6(5)	4(5)	-(0)	1(1)	5(4)	3(5)	1(2)	-(0)	-(0)
113	Ledum glandulosum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
206	Linnaea borealis	1(15)	-(0)	-(0)	10(37)	10(18)	+(0)	1(0)	-(0)	-(0)	-(0)	-(0)	-(0)
154	Lonicera caerulea	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
115	Lonicera utahensis	9(6)	8(6)	9(12)	4(2)	7(6)	9(11)	8(7)	6(2)	3(5)	7(4)	5(2)	-(0)
116	Menziesia ferruginea	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
118	Pachistima myrsinites	6(3)	10(9)	10(14)	2(2)	1(3)	8(7)	8(3)	9(4)	1(9)	6(8)	10(20)	3(1)
122	Physocarpus malvaceus	-(0)	10(59)	3(3)	-(0)	-(0)	-(0)	-(0)	1(3)	-(0)	-(0)	-(0)	-(0)
124	Prunus virginiana	-(0)	1(1)	2(2)	-(0)	-(0)	-(0)	-(0)	5(1)	-(0)	-(0)	2(1)	1(1)
125	Purshia tridentata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
128	Ribes cereum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(0)	-(0)	3(1)
158	Ribes hudsonianum	1(15)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
130	Ribes lacustre	7(7)	3(2)	4(1)	4(3)	3(3)	1(2)	3(2)	2(1)	2(1)	1(1)	-(0)	1(1)
159	Ribes montigenum	1(2)	-(0)	-(0)	1(3)	1(1)	1(2)	1(1)	-(0)	5(3)	2(2)	5(7)	3(1)
131	Ribes viscosissimum	3(2)	-(0)	4(1)	-(0)	2(2)	3(1)	1(1)	-(0)	1(1)	4(3)	2(1)	6(2)
132	Rosa acicularis	1(3)	-(0)	-(0)	3(2)	-(0)	+(1)	-(0)	-(0)	2(6)	1(15)	-(0)	-(0)
133	Rosa gymnocarpa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
161	Rosa nutkana	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
134	Rosa woodsii	-(0)	1(1)	-(0)	-(0)	-(0)	+(1)	1(1)	1(1)	-(0)	-(0)	3(1)	-(0)
136	Rubus parviflorus	6(8)	1(3)	7(5)	-(0)	-(0)	3(3)	2(1)	-(0)	1(2)	2(2)	3(1)	-(0)
139	Sheperdia canadensis	2(1)	4(1)	6(6)	7(4)	4(12)	3(4)	4(2)	5(4)	3(4)	5(5)	2(3)	-(0)
140	Sorbus scopulina	5(10)	5(6)	10(14)	2(1)	1(1)	8(4)	3(4)	3(1)	1(1)	7(2)	7(1)	3(1)
142	Spiraea betulifolia	4(7)	8(17)	5(13)	2(15)	3(8)	7(10)	3(8)	3(22)	2(7)	10(41)	-(0)	-(0)
162	Spiraea pyramidata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
143	Symphoricarpos albus	2(10)	5(9)	-(0)	2(15)	-(0)	1(1)	1(3)	10(15)	2(1)	-(0)	-(0)	-(0)
163	Symphoricarpos oreophilus	1(2)	-(0)	3(1)	2(3)	1(3)	1(2)	-(0)	1(15)	4(7)	4(3)	5(6)	10(1)
145	Vaccinium caespitosum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
146	Vaccinium globulare	5(16)	-(0)	7(32)	1(3)	3(5)	10(47)	10(38)	1(1)	1(1)	2(1)	-(0)	-(0)
148	Vaccinium scoparium	1(15)	-(0)	1(1)	3(1)	10(44)	2(1)	10(37)	1(1)	1(3)	1(1)	-(0)	-(0)
	FERN ALLIES												
254	Equisetum arvensis	2(0)	-(0)	-(0)	2(1)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)
	GRAMINOIDS												
301	Agropyron spicatum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	2(1)	-(0)
304	Bromus vulgaris	3(5)	1(1)	3(10)	-(0)	1(3)	2(6)	1(15)	2(8)	1(3)	1(3)	-(0)	-(0)
305	Calamagrostis canadensis	1(1)	-(0)	-(0)	1(1)	1(1)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)
307	Calamagrostis rubescens	2(5)	5(5)	6(6)	6(24)	7(17)	6(22)	4(40)	8(28)	5(9)	4(10)	3(19)	1(1)
308	Carex conncinoides	-(0)	-(0)	-(0)	-(0)	1(1)	+(3)	-(0)	-(0)	-(0)	1(3)	-(0)	-(0)
339	Carex disperma	1(3)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
309	Carex geyeri	4(7)	-(0)	3(5)	1(3)	1(1)	4(10)	4(4)	3(14)	5(18)	3(26)	-(0)	1(1)
311	Carex rossii	4(1)	3(1)	4(1)	1(1)	1(1)	4(1)	3(1)	2(1)	2(13)	3(1)	2(1)	9(1)
316	Elymus glaucus	5(1)	3(0)	4(2)	6(2)	3(1)	3(1)	5(1)	3(5)	7(5)	3(1)	5(1)	-(0)
317	Festuca idahoensis	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)
348	Hesperochloa kingii	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
322	Juncus parryi	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
323	Koeleria cristata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
325	Luzula hitchcockii	-(0)	-(0)	1(3)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
349	Melica bulbosa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(3)	-(0)	-(0)	-(0)
329	Oryzopsis asperifolia	1(3)	-(0)	-(0)	1(15)	1(15)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)
331	Poa nervosa	1(3)	3(1)	1(1)	1(15)	1(1)	1(2)	1(1)	2(1)	3(8)	3(1)	2(1)	1(1)
360	Stipa occidentalis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(2)	-(0)	-(0)	-(0)

Code to constancy values: + = 0-5% 1 = 5-15% 2 = 15-25% 3 = 25-35% 4 = 35-45% 5 = 45-55% 6 = 55-65% 7 = 65-75%
8 = 75-85% 9 = 85-95% 10 = 95-100% (Canopy coverage expressed to nearest %)

Appendix B. Cont.

Code Number	Series / Habitat Type / Phase / No. of Stands	ABIES LASIOCARPA											
		ACRU	PHMA	ACGL	LIBO		VAGL		SYAL	THOC	SPBE	OSCH	
					LIBO	VASC	PAMY	VASC				PAMY	OSCH
		n = 14	n = 8	n = 10	n = 9	n = 12	n = 33	n = 16	n = 11	n = 15	n = 18	n = 6	n = 7
	FORBS												
401	Achillaea millefolium	-(0)	-(0)	1(1)	4(1)	1(1)	+(1)	-(0)	4(1)	3(5)	1(1)	2(1)	3(1)
402	Actaea rubra	10(5)	1(0)	2(0)	2(0)	-(0)	1(0)	1(0)	1(0)	1(0)	1(1)	-(0)	1(1)
565	Aconitum columbianum	1(1)	-(0)	-(0)	2(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
403	Adenocaulon bicolor	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
738	Antennaria corymbosa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
414	Antennaria microphylla	-(0)	-(0)	-(0)	2(8)	2(0)	1(1)	-(0)	2(1)	-(0)	1(1)	-(0)	-(0)
413	Antennaria racemosa	1(2)	-(0)	1(1)	3(1)	5(3)	1(13)	6(1)	1(1)	2(6)	1(3)	-(0)	-(0)
754	Aquilegia coerulea	4(4)	1(1)	4(0)	4(1)	3(2)	2(1)	2(1)	1(1)	1(9)	3(1)	8(4)	1(1)
577	Arenaria aculeata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
420	Arenaria macrophylla	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)
421	Arnica cordifolia	8(9)	8(4)	10(3)	10(11)	9(12)	10(8)	10(7)	7(11)	10(13)	9(9)	10(23)	4(1)
422	Arnica latifolia	2(7)	-(0)	-(0)	-(0)	-(0)	1(8)	1(2)	-(0)	-(0)	-(0)	3(2)	-(0)
426	Aster conspicuus	2(11)	5(5)	1(3)	6(19)	4(4)	2(8)	3(11)	3(33)	5(20)	3(10)	-(0)	-(0)
582	Aster engelmannii	7(4)	4(1)	9(2)	-(0)	1(1)	7(3)	3(2)	2(1)	5(9)	4(2)	8(2)	3(2)
430	Astragalus miser	1(1)	-(0)	-(0)	3(3)	2(2)	+(1)	1(1)	2(2)	4(2)	2(1)	-(0)	-(0)
431	Balsamhoriza sagitatta	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	2(2)	1(1)	1(1)	-(0)	-(0)
696	Caltha biflora	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
741	Castilleja covilleana	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
438	Castilleja miniata	-(0)	-(0)	-(0)	1(1)	1(1)	1(1)	1(1)	1(0)	1(1)	-(0)	-(0)	-(0)
595	Chaenactis douglasii	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
442	Chimaphila umbellata	3(0)	-(0)	4(5)	-(0)	2(1)	5(2)	3(1)	2(1)	1(2)	2(1)	-(0)	-(0)
447	Clintonia uniflora	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
449	Coptis occidentalis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
602	Crepis accuminata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)
458	Dodecatheon jeffreyi	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
455	Disporum trachycarpum	4(3)	9(3)	4(1)	1(1)	1(1)	1(1)	1(1)	3(1)	1(2)	2(1)	2(1)	1(1)
459	Epilobium angustifolium	4(1)	5(1)	2(1)	9(1)	6(5)	3(1)	5(1)	9(1)	6(5)	4(3)	8(1)	4(1)
465	Fragaria vesca	6(1)	9(2)	5(2)	6(1)	2(3)	3(1)	3(1)	3(1)	3(5)	4(1)	2(3)	3(2)
466	Fragaria virginiana	3(1)	-(0)	-(0)	3(6)	4(2)	1(1)	2(1)	5(1)	3(2)	2(5)	2(15)	-(0)
471	Galium triflorum	7(5)	3(3)	6(3)	1(1)	1(3)	2(1)	1(1)	4(1)	-(0)	2(1)	2(1)	1(1)
620	Geranium richardsonii	5(3)	-(0)	1(1)	4(5)	3(2)	2(2)	1(3)	-(0)	6(14)	-(0)	2(1)	3(2)
473	Geranium viscosissimum	1(1)	-(0)	1(1)	3(1)	-(0)	2(1)	1(1)	6(3)	2(5)	7(2)	5(11)	1(1)
474	Geum triflorum	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(2)	-(0)	-(0)	-(0)
476	Goodyera oblongifolia	5(1)	3(1)	7(1)	-(0)	-(0)	5(1)	3(1)	1(1)	2(1)	4(1)	5(1)	1(1)
484	Hieracium albiflorum	3(1)	1(1)	4(2)	-(0)	1(3)	6(1)	3(1)	4(1)	1(1)	6(1)	2(1)	1(1)
486	Hieracium gracile	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(2)	-(0)	-(0)	-(0)
489	Ligusticum canbyi	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
756	Ligusticum filicinum	1(1)	-(0)	-(0)	-(0)	-(0)	2(1)	1(3)	3(1)	1(1)	1(1)	3(1)	-(0)
490	Ligusticum tenuifolium	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
497	Lomatium dissectum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(9)	-(0)	-(0)	-(0)
641	Lupinus argenteus	-(0)	-(0)	-(0)	1(1)	2(2)	1(1)	1(1)	3(1)	1(9)	-(0)	2(1)	1(3)
642	Lupinus polyphyllus	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
649	Mitella pentandra	1(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
502	Mitella stauropetala	5(1)	6(1)	7(1)	-(0)	1(1)	2(1)	3(1)	-(0)	-(0)	2(0)	7(1)	1(1)
505	Osmorhiza chilensis	7(4)	4(6)	3(6)	4(2)	5(2)	4(2)	3(2)	3(1)	10(8)	4(1)	-(0)	10(14)
653	Osmorhiza depauperata	4(2)	1(1)	6(14)	3(1)	1(1)	4(3)	6(2)	5(1)	-(0)	3(2)	10(15)	-(0)
507	Pedicularis bracteosa	1(1)	1(1)	1(1)	1(3)	1(1)	2(1)	2(0)	2(2)	3(3)	1(1)	-(0)	-(0)
509	Pedicularis racemosa	4(2)	3(1)	5(7)	-(0)	2(1)	4(3)	5(3)	2(1)	3(10)	1(2)	2(3)	3(8)
514	Penstemon wilcoxii	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
663	Phacelia hastata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
669	Potentilla diversifolia	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
521	Potentilla flabellifolia	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
670	Potentilla gracilis	1(3)	-(0)	-(0)	2(2)	-(0)	+(1)	-(0)	2(1)	5(5)	2(1)	-(0)	-(0)
526	Pyrola asarifolia	2(2)	-(0)	1(1)	2(3)	2(2)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)
529	Pyrola secunda	8(3)	8(1)	8(2)	8(2)	8(2)	7(4)	7(3)	5(1)	5(2)	7(2)	5(6)	3(1)
676	Saxifraga arguta	2(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
538	Senecio pseudaureus	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
681	Senecio streptanthifolius	-(0)	-(0)	-(0)	1(1)	1(1)	-(0)	-(0)	1(1)	-(0)	1(3)	2(1)	-(0)
539	Senecio triangularis	1(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(0)	-(0)	-(0)	-(0)	-(0)	-(0)
542	Smilacina racemosa	1(1)	6(1)	4(1)	-(0)	-(0)	1(1)	-(0)	4(1)	1(2)	2(0)	3(1)	6(1)
543	Smilacina stellata	4(4)	1(1)	-(0)	2(1)	-(0)	1(1)	-(0)	-(0)	3(5)	1(1)	-(0)	1(3)
684	Solidago multiradiata	1(1)	-(0)	-(0)	4(1)	2(2)	1(1)	-(0)	-(0)	4(1)	-(0)	-(0)	-(0)
546	Streptopus amplexifolius	2(2)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)
714	Thalictrum fendleri	3(8)	4(5)	4(8)	1(1)	-(0)	3(4)	4(3)	3(1)	-(0)	1(3)	7(5)	9(8)
547	Thalictrum occidentale	6(8)	4(1)	2(15)	4(2)	3(2)	2(6)	1(3)	2(2)	10(29)	4(1)	3(2)	-(0)
560	Trillium ovatum	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
690	Trollius laxus	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)
551	Valeriana sitchensis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(8)	-(0)	-(0)
552	Veratrum viride	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
554	Viola adunca	1(3)	4(1)	4(1)	2(2)	1(1)	3(1)	2(7)	5(1)	3(2)	3(0)	3(2)	7(5)
555	Viola canadensis	-(0)	1(0)	1(1)	-(0)	-(0)	1(1)	1(1)	1(1)	1(3)	1(1)	-(0)	-(0)
693	Viola nuttallii	-(0)	-(0)	1(1)	-(0)	-(0)	+(1)	-(0)	-(0)	-(0)	-(0)	-(0)	4(1)
557	Viola orbiculata	2(5)	1(1)	-(0)	-(0)	1(3)	-(0)	2(1)	-(0)	1(2)	-(0)	-(0)	-(0)
694	Viola purpurea	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
558	Xerophyllum tenax	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)

Appendix B. Cont.

Code Number	Series / Habitat Type / Phase / No. of Stands	ABIES LASIOCARPA CARU n = 8	VASC VASC n = 59	PIAL n = 23	ARLA n = 8	CARU PAMY n = 5	CARU CARU n = 27	BERE n = 31	ARCO ASMI n = 10	ARCO ARCO n = 32	PERA n = 9	RIMO n = 5
	TREES											
001	Abies grandis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
002	Abies lasiocarpa	10(17)	10(32)	10(20)	10(29)	10(12)	10(26)	10(40)	10(14)	10(28)	10(57)	10(42)
006	Larix occidentalis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
007	Picea englemannii	4(1)	8(29)	8(16)	6(14)	2(3)	2(4)	5(24)	5(21)	8(22)	6(26)	6(76)
022	Picea pungens	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(26)	1(98)	-(0)	-(0)	-(0)
009	Pinus albicaulis	1(1)	3(2)	10(43)	4(38)	-(0)	2(0)	+(15)	-(0)	3(9)	2(9)	2(18)
010	Pinus contorta	10(47)	8(29)	7(23)	5(21)	4(20)	9(24)	5(25)	9(41)	7(27)	8(28)	1(8)
011	Pinus flexilis	-(0)	2(5)	-(0)	1(3)	2(1)	+(1)	4(7)	5(9)	1(43)	1(1)	3(3)
013	Pinus ponderosa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
014	Populus tremuloides	1(1)	-(0)	-(0)	1(37)	2(15)	2(13)	3(16)	2(19)	1(20)	-(0)	1(3)
016	Pseudotsuga menziesii	4(5)	1(17)	+(15)	4(21)	10(43)	5(34)	8(32)	1(37)	5(32)	6(24)	2(3)
	SHRUBS AND SUBSHRUBS											
102	Acer glabrum	-(0)	-(0)	-(0)	-(0)	4(2)	-(0)	2(2)	-(0)	0(0)	1(3)	-(0)
167	Acer grandidentatum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
104	Alnus sinuata	-(0)	+(9)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
105	Amelanchier alnifolia	3(1)	1(1)	-(0)	1(1)	6(7)	3(1)	4(5)	-(0)	1(1)	1(1)	-(0)
201	Arctostaphylos uva-ursi	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	2(2)	+(1)	-(0)	-(0)
150	Artemisia tridentata	-(0)	-(0)	-(0)	-(0)	-(0)	1(19)	+(1)	-(0)	-(0)	-(0)	1(1)
203	Berberis repens	3(1)	1(1)	-(0)	1(1)	8(1)	3(0)	9(3)	4(1)	2(1)	1(1)	-(0)
107	Ceanothus velutinus	-(0)	-(0)	-(0)	-(0)	2(1)	1(0)	1(9)	-(0)	-(0)	1(0)	-(0)
173	Cercocarpus ledifolius	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
149	Rhamnus purshiana	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
204	Clematis columbiana	-(0)	-(0)	-(0)	-(0)	4(2)	1(1)	1(1)	-(0)	-(0)	-(0)	-(0)
205	Gaultheria humifusa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
112	Juniperus communis	1(1)	1(3)	+(3)	1(1)	-(0)	1(1)	5(2)	7(2)	2(2)	1(1)	1(3)
113	Ledum glandulosum	1(1)	+(1)	+(3)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
206	Linnaea borealis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(0)
154	Lonicera caerulea	1(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
115	Lonicera utahensis	8(2)	5(3)	1(1)	3(1)	4(9)	2(1)	4(6)	1(1)	2(3)	1(3)	-(0)
116	Menziesia ferruginea	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
118	Pachistima myrsinites	5(1)	3(6)	+(15)	4(10)	10(38)	1(1)	8(17)	4(1)	2(1)	6(2)	-(0)
122	Physocarpus malvaceus	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)	-(0)	-(0)
124	Prunus virginiana	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(5)	-(0)	-(0)	-(0)	-(0)
125	Purshia tridentata	-(0)	-(0)	-(0)	-(0)	2(1)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)
128	Ribes cereum	-(0)	+(15)	-(0)	-(0)	-(0)	1(3)	1(1)	-(0)	+(1)	1(1)	-(0)
158	Ribes hudsonianum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
130	Ribes lacustre	-(0)	1(4)	+(3)	-(0)	-(0)	1(8)	-(0)	-(0)	1(1)	-(0)	-(0)
159	Ribes montigenum	-(0)	2(2)	1(2)	9(5)	-(0)	1(1)	2(0)	2(2)	5(1)	4(2)	10(16)
131	Ribes viscosissimum	-(0)	1(0)	-(0)	3(1)	4(1)	+(1)	2(1)	1(1)	1(1)	2(2)	-(0)
132	Rosa acicularis	-(0)	+(2)	-(0)	-(0)	-(0)	1(9)	+(1)	2(8)	+(1)	-(0)	-(0)
133	Rosa gymnocarpa	1(15)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
161	Rosa nutkana	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	2(3)	1(3)	-(0)	1(3)	-(0)
134	Rosa woodsii	-(0)	+(1)	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	1(1)	-(0)	-(0)
136	Rubus parviflorus	1(1)	1(1)	-(0)	1(1)	-(0)	-(0)	1(2)	-(0)	+(1)	-(0)	-(0)
139	Sheperdia canadensis	4(1)	2(9)	+(0)	1(1)	6(1)	1(2)	5(5)	7(7)	4(14)	3(2)	-(0)
140	Sorbus scopulina	3(1)	3(1)	-(0)	3(1)	2(3)	1(4)	2(1)	-(0)	1(1)	4(0)	1(3)
142	Spiraea betulifolia	3(8)	1(1)	-(0)	-(0)	4(2)	1(1)	1(3)	-(0)	1(0)	-(0)	-(0)
162	Spiraea pyramidata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
143	Symphoricarpos albus	-(0)	-(0)	-(0)	-(0)	-(0)	1(2)	+(3)	-(0)	-(0)	-(0)	-(0)
163	Symphoricarpos oreophilus	-(0)	1(2)	-(0)	3(9)	6(1)	6(3)	7(6)	1(1)	4(1)	6(2)	2(1)
145	Vaccinium caespitosum	1(63)	+(2)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)	-(0)	-(0)	-(0)
146	Vaccinium globulare	1(3)	2(2)	3(2)	-(0)	2(1)	1(0)	-(0)	-(0)	-(0)	2(2)	-(0)
148	Vaccinium scoparium	10(59)	10(57)	10(58)	3(2)	-(0)	1(1)	-(0)	-(0)	2(1)	-(0)	1(1)
	FERN ALLIES											
245	Equisetum arvensis	-(0)	+(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
	GRAMINOIDS											
301	Agropyron spicatum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	+(3)	-(0)	-(0)	-(0)	-(0)
304	Bromus vulgaris	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	+(1)	-(0)	1(2)	-(0)	-(0)
305	Calamagrostis canadensis	-(0)	+(2)	+(0)	-(0)	-(0)	+(37)	-(0)	-(0)	1(1)	-(0)	1(1)
307	Calamagrostis rubescens	10(40)	1(2)	+(0)	1(1)	10(68)	10(51)	2(2)	-(0)	+(1)	-(0)	-(0)
308	Carex conncinoides	1(1)	-(0)	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	+(1)	-(0)	-(0)
339	Carex disperma	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
309	Carex geyeri	6(11)	4(14)	3(9)	3(26)	-(0)	7(13)	2(2)	-(0)	2(1)	3(1)	2(2)
311	Carex rossii	5(2)	5(1)	6(2)	8(1)	2(1)	4(4)	6(1)	8(2)	5(3)	9(3)	5(4)
316	Elymus glaucus	1(1)	2(2)	3(1)	-(0)	-(0)	1(1)	2(3)	1(0)	+(1)	-(0)	-(0)
317	Festuca idahoensis	-(0)	+(1)	-(0)	3(1)	-(0)	1(6)	1(1)	2(2)	+(3)	-(0)	1(1)
348	Hesperochloa kingii	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
322	Juncus parryi	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
323	Koeleria cristata	-(0)	-(0)	-(0)	-(0)	-(0)	+(0)	-(0)	-(0)	-(0)	-(0)	-(0)
325	Luzula hitchcockii	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
349	Melica bulbosa	-(0)	-(0)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)	-(0)	-(0)	1(1)
329	Oryzopsis asperifolia	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
331	Poa nervosa	1(1)	3(3)	4(1)	8(2)	4(1)	3(1)	4(4)	5(8)	4(2)	2(2)	2(6)
360	Stipa occidentalis	-(0)	-(0)	-(0)	-(0)	-(0)	1(1)	1(1)	1(1)	-(0)	-(0)	1(1)

Code to constancy values: + = 0-5% 1 = 5-15% 2 = 15-25% 3 = 25-35% 4 = 35-45% 5 = 45-55% 6 = 55-65%
7 = 65-75% 8 = 75-85% 9 = 85-95% 10 = 95-100% (Canopy coverage expressed to nearest %)

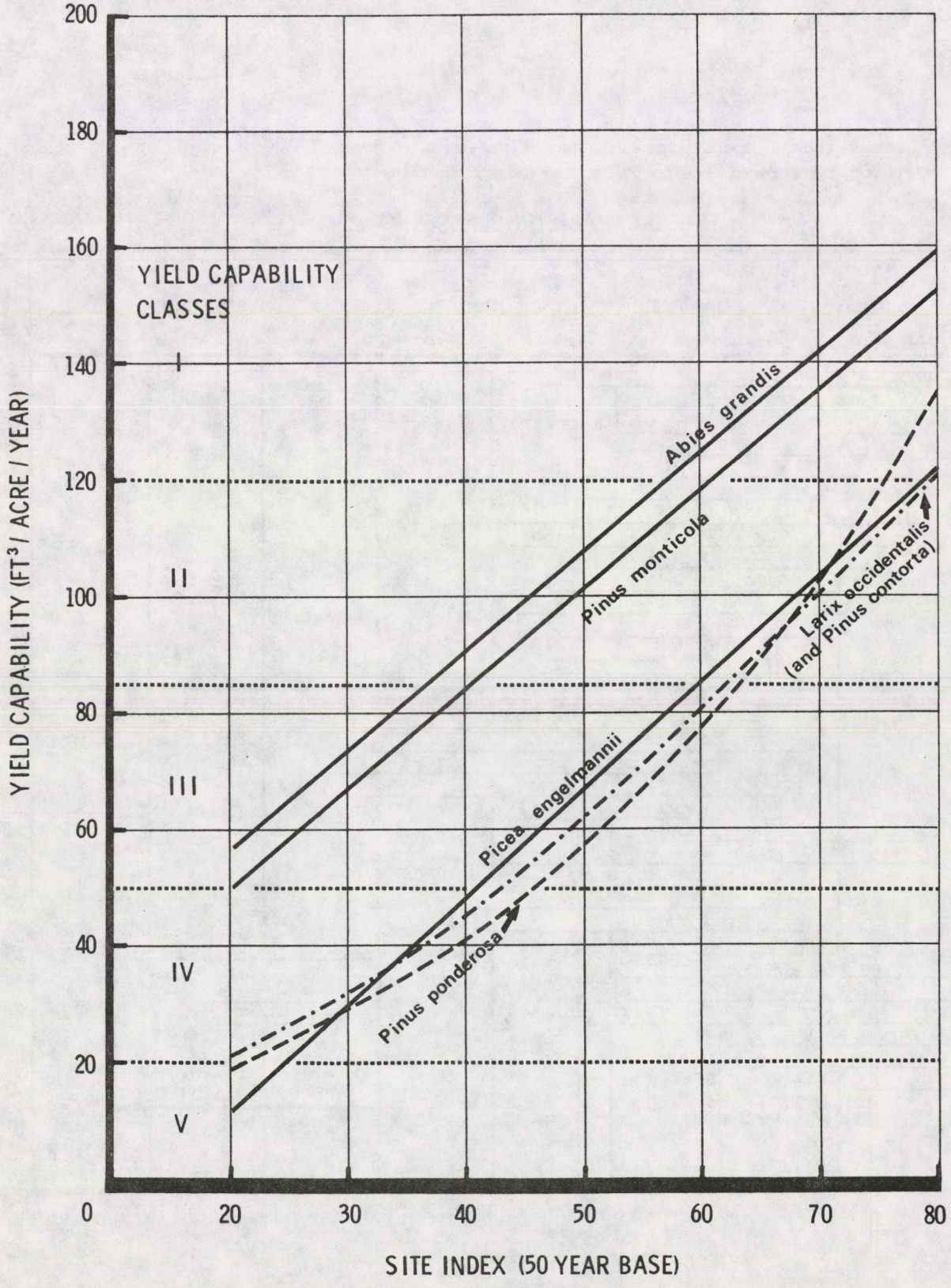
Appendix B. Cont.

Code Number		Series: ABIES LASIOCARPA										
	Habitat Type		VASC		ARLA	CARU		BERE	ARCO		PERA	RIMO
	Phase	CARU	VASC	PIAL		PAMY	CARU		ASMI	ARCO		
	No. of Stands	n = 8	n = 59	n = 23	n = 8	n = 5	n = 27	n = 31	n = 10	n = 32	n = 9	n = 5
	FORBS											
401	Achillaea millefolium	4(1)	1(1)	3(1)	8(1)	2(1)	7(1)	2(2)	4(2)	1(2)	2(2)	5(1)
402	Actaea rubra	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(2)	-(0)	-(0)	-(0)	-(0)
565	Aconitum columbianum	-(0)	-(0)	-(0)	-(0)	-(0)	+(37)	-(0)	-(0)	-(0)	-(0)	-(0)
403	Adenocaulon bicolor	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	+(3)	-(0)	-(0)	-(0)	-(0)
738	Antennaria corymbosa	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
414	Antennaria microphylla	3(1)	1(1)	1(8)	3(3)	2(1)	2(1)	1(1)	6(7)	2(1)	-(0)	-(0)
413	Antennaria racemosa	1(1)	2(2)	3(3)	-(0)	2(3)	1(1)	2(4)	1(1)	3(3)	-(0)	-(0)
754	Aquilegia coerulea	1(1)	3(1)	3(3)	6(1)	-(0)	1(2)	5(1)	2(9)	3(3)	4(1)	3(2)
577	Arenaria aculeata	-(0)	+(1)	+(1)	-(0)	-(0)	2(1)	-(0)	-(0)	-(0)	-(0)	1(1)
420	Arenaria macrophylla	-(0)	1(1)	-(0)	-(0)	-(0)	1(3)	-(0)	-(0)	+(1)	-(0)	-(0)
421	Arnica cordifolia	6(5)	8(7)	7(13)	4(6)	8(8)	6(9)	8(20)	10(10)	10(17)	9(10)	7(3)
422	Arnica latifolia	1(1)	3(4)	4(7)	10(18)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	1(1)
426	Aster conspicuus	-(0)	1(1)	+(3)	4(6)	-(0)	1(14)	1(18)	2(19)	3(4)	2(1)	-(0)
582	Aster engelmannii	3(1)	1(1)	3(3)	5(4)	4(1)	1(2)	3(6)	1(1)	1(1)	4(1)	1(1)
430	Astragalus miser	3(1)	1(2)	1(5)	3(1)	-(0)	1(2)	3(10)	10(16)	1(0)	-(0)	3(2)
431	Balsamorhiza sagitatta	-(0)	-(0)	-(0)	-(0)	-(0)	1(2)	1(1)	-(0)	-(0)	-(0)	-(0)
696	Caltha biflora	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
741	Castilleja covilleana	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
438	Castilleja miniata	-(0)	+(1)	+(1)	-(0)	2(1)	1(2)	+(1)	-(0)	+(1)	1(0)	-(0)
595	Chaenactis douglasii	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
442	Chimaphila umbellata	3(2)	1(1)	-(0)	-(0)	2(1)	1(1)	1(2)	-(0)	1(1)	-(0)	-(0)
447	Clintonia uniflora	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
449	Coptis occidentalis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
602	Crepis accuminata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	+(3)	-(0)	-(0)	-(0)	-(0)
458	Dodecatheon jeffreyi	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
455	Disporum trachycarpum	-(0)	-(0)	-(0)	-(0)	2(1)	+(1)	2(1)	-(0)	+(1)	-(0)	-(0)
459	Epilobium angustifolium	5(1)	6(2)	6(4)	6(2)	6(1)	4(1)	4(1)	9(3)	6(3)	4(1)	5(6)
465	Fragaria vesca	1(1)	2(1)	1(1)	4(2)	2(1)	1(2)	5(2)	2(1)	3(1)	3(1)	1(1)
466	Fragaria virginiana	6(2)	1(1)	+(1)	-(0)	-(0)	3(3)	2(4)	5(3)	1(1)	1(1)	3(3)
471	Galium triflorum	-(0)	+(1)	-(0)	-(0)	-(0)	1(1)	+(1)	-(0)	1(1)	-(0)	-(0)
620	Geranium richardsonii	-(0)	1(3)	1(2)	-(0)	-(0)	1(0)	1(8)	1(3)	+(1)	2(3)	1(3)
473	Geranium viscosissimum	5(5)	1(3)	+(1)	4(1)	2(3)	3(4)	3(2)	6(1)	3(1)	4(1)	1(1)
474	Geum triflorum	-(0)	-(0)	-(0)	1(1)	-(0)	-(0)	-(0)	1(1)	1(1)	-(0)	-(0)
476	Goodyera oblongifolia	-(0)	1(1)	+(1)	-(0)	6(1)	+(1)	2(2)	-(0)	1(1)	2(2)	1(0)
484	Hieracium albiflorum	4(1)	2(1)	+(1)	4(1)	2(1)	3(1)	3(1)	3(1)	3(1)	3(2)	-(0)
486	Hieracium gracile	1(1)	1(1)	3(2)	1(1)	-(0)	+(1)	-(0)	-(0)	-(0)	1(1)	-(0)
489	Ligusticum canbyi	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
756	Ligusticum filicinum	1(1)	1(1)	-(0)	4(1)	2(1)	1(1)	+(1)	-(0)	1(1)	2(2)	-(0)
490	Ligusticum tenuifolium	-(0)	+(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
497	Lomatium dissectum	-(0)	+(3)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
641	Lupinus argenteus	4(1)	1(5)	1(15)	3(1)	4(8)	2(3)	1(5)	5(5)	2(1)	1(1)	3(5)
642	Lupinus polyphyllus	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
649	Mitella pentandra	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
502	Mitella stauropetala	-(0)	1(1)	-(0)	3(1)	-(0)	+(1)	2(1)	-(0)	1(1)	2(1)	1(1)
505	Osmorhiza chilensis	-(0)	2(1)	2(0)	5(1)	6(1)	2(2)	4(1)	1(0)	2(2)	3(1)	1(2)
653	Osmorhiza depauperata	3(1)	3(1)	2(1)	4(1)	4(1)	1(1)	4(2)	3(1)	4(1)	4(1)	5(2)
507	Pedicularis bracteosa	3(1)	2(1)	4(4)	-(0)	2(1)	1(1)	1(0)	-(0)	-(0)	1(1)	1(1)
509	Pedicularis racemosa	3(1)	6(4)	3(1)	5(4)	2(1)	3(1)	3(3)	1(0)	1(0)	10(8)	1(0)
514	Penstemon wilcoxii	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)
663	Phacelia hastata	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	+(1)	-(0)	1(1)
669	Potentilla diversifolia	-(0)	1(1)	1(3)	1(1)	-(0)	-(0)	-(0)	1(0)	+(1)	-(0)	1(1)
521	Potentilla flabellifolia	-(0)	-(0)	-(0)	-(0)	-(0)	+(15)	-(0)	-(0)	-(0)	-(0)	-(0)
670	Potentilla gracilis	-(0)	+(0)	-(0)	1(3)	-(0)	+(1)	+(0)	1(1)	1(1)	-(0)	1(1)
526	Pyrola asarifolia	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	+(0)	-(0)	-(0)	-(0)	-(0)
529	Pyrola secunda	4(1)	6(2)	4(2)	3(1)	6(1)	3(1)	6(2)	6(3)	8(6)	6(5)	5(4)
676	Saxifraga arguta	-(0)	+(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
538	Senecio pseudaureus	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
681	Senecio streptanthifolius	-(0)	+(1)	+(1)	-(0)	-(0)	1(1)	1(1)	-(0)	2(1)	1(1)	1(1)
539	Senecio triangularis	-(0)	+(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
542	Smilacina racemosa	-(0)	+(0)	-(0)	-(0)	6(1)	2(1)	1(1)	-(0)	1(1)	1(1)	1(1)
543	Smilacina stellata	-(0)	+(1)	+(0)	-(0)	-(0)	-(0)	-(0)	1(3)	+(1)	-(0)	-(0)
684	Solidago multiradiata	1(1)	2(1)	2(1)	3(1)	-(0)	2(1)	2(2)	5(1)	4(1)	-(0)	3(2)
546	Streptopus amplexifolius	-(0)	+(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
714	Thalictrum fendleri	1(15)	2(3)	1(19)	3(2)	2(1)	2(1)	5(2)	2(2)	2(1)	2(1)	1(3)
547	Thalictrum occidentale	-(0)	2(2)	-(0)	-(0)	-(0)	1(7)	2(1)	-(0)	2(1)	3(1)	-(0)
560	Trillium ovatum	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
690	Trollius laxus	-(0)	+(1)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)
551	Valeriana sitchensis	1(1)	1(3)	1(3)	-(0)	-(0)	2(1)	-(0)	-(0)	1(1)	1(3)	-(0)
552	Veratrum viride	-(0)	-(0)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)	-(0)	-(0)	-(0)
554	Viola adunca	5(1)	1(0)	-(0)	-(0)	2(1)	5(1)	3(3)	1(3)	1(1)	1(1)	-(0)
555	Viola canadensis	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	1(5)	-(0)	+(1)	-(0)	1(15)
693	Viola nuttallii	1(1)	+(1)	-(0)	4(1)	-(0)	+(1)	1(1)	1(1)	1(1)	2(1)	2(1)
557	Viola orbiculata	-(0)	1(1)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)	-(0)	-(0)	-(0)
694	Viola purpurea	-(0)	-(0)	-(0)	-(0)	-(0)	+(1)	-(0)	-(0)	-(0)	-(0)	1(1)
558	Xerophyllum tenax	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)	-(0)

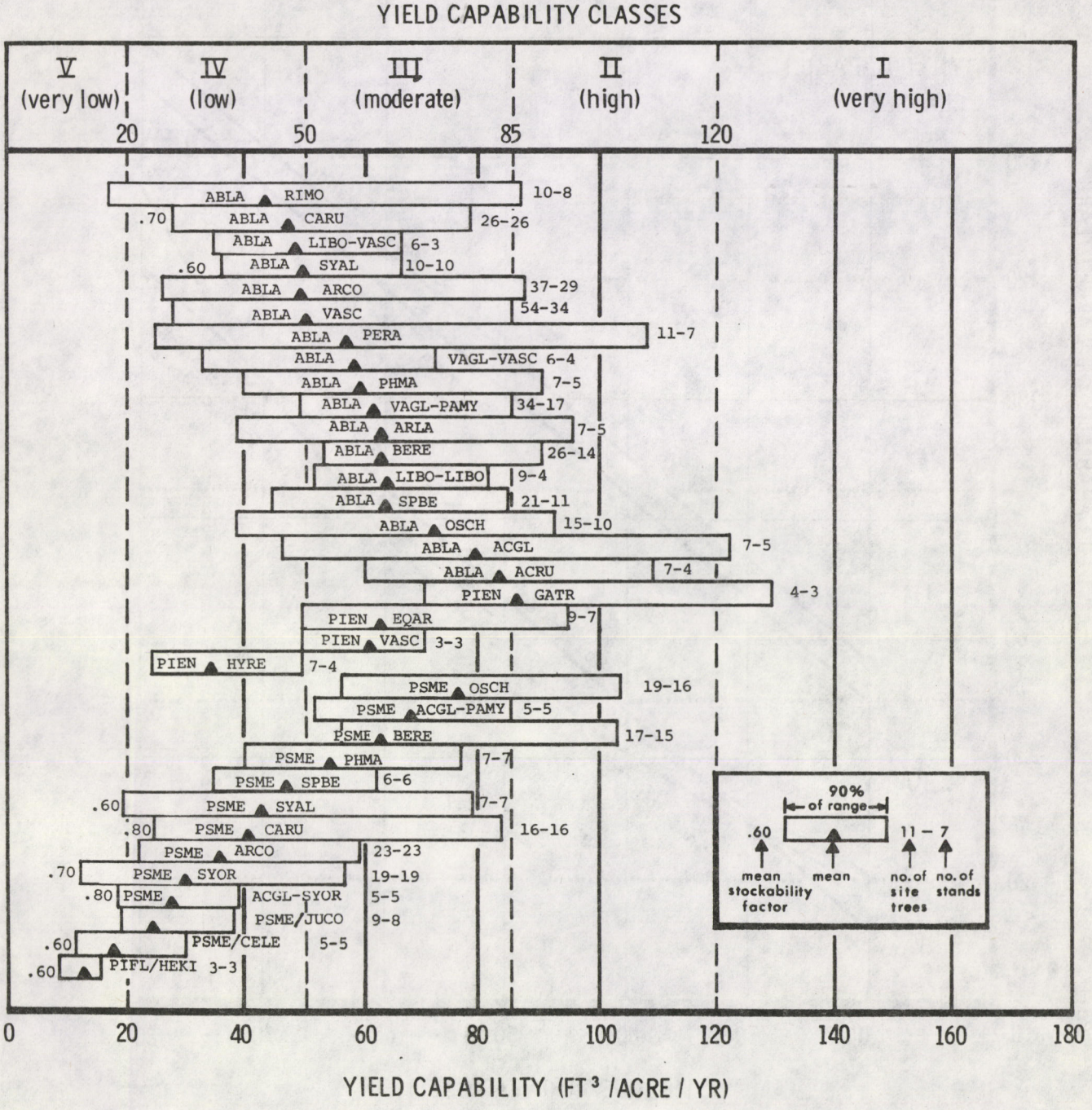
APPENDIX C-1. Mean basal areas and 50-year site indexes for eastern Idaho-western Wyoming stands by habitat type. Means are shown where n = 3 or more; confidence limits (95 percent) for estimating the mean are given where n = 5 or more.

Habitat type	Basal area (ft^2/area)	Site index by species			
		PSME	PICO	PIEN	ABLA
PIFL/HEKI	91± ?	20± ?	*	*	*
PSME/PHMA	180±126	47± 8	*	*	*
PSME/ACGL, PAMY	188±175	55± 8	*	*	*
/ACGL, SYOR	150± 91	37±13	*	*	*
PSME/SYAL	116± 62	53±10	*	*	*
PSME/SPBE	184± 60	43± 7	*	*	*
PSME/OSCH	202± 54	60± 5	*	*	*
PSME/CARU	161± 33	45± 6	*	*	*
PSME/JUCO	176± 40	26± 8	*	*	*
PSME/CELE	87± 45	26± 8	*	*	*
PSME/BERE	182± 33	50± 8	*	*	*
PSME/ARCO	172± 27	36± 4	*	*	*
PSME/SYOR	124± 35	38± 5	*	*	*
PIEN/EQAR	238±100	*	*	49±15	*
PIEN/GATR	344± ?	*	*	*	*
PIEN/VASC	262± ?	*	*	*	*
PIEN/HYRE	223± 69	34± ?	*	32± ?	*
ABLA/ACRU	244± 96	*	*	56± ?	*
ABLA/PHMA	187± 52	50± ?	*	*	52± ?
ABLA/ACGL	159± 77	60± ?	*	*	58± ?
ABLA/LIBO, VASC	128± ?	*	45± ?	*	45± ?
/LIBO, LIBO	222± 77	*	*	51± ?	*
ABLA/VAGL, VASC	184± 95	*	*	*	*
/VAGL, PAMY	178± 32	46± 9	48± 7	52±10	50±12
ABLA/SYAL	128± 27	47± ?	50±11	*	54±12
ABLA/SPBE	175± 32	52±15	49± ?	44± ?	52±10
ABLA/VASC	176± 27	*	44± 5	42± 6	40± 6
ABLA/ARLA	220±180	*	*	*	41± ?
ABLA/OSCH	220± 62	*	53± ?	*	56± 6
ABLA/CARU	156± 30	46± 6	47± 6	*	48± 4
ABLA/BERE	196± 48	50± 7	47±11	52± ?	50± 9
ABLA/RIMO	194± 86	*	*	42± ?	36±13
ABLA/PERA	188± 39	*	*	*	46± 9
ABLA/ARCO	187± 25	61± ?	44±10	38±12	37± 7

APPENDIX C-2 Yield capability of fully stocked natural stands in relation to site index.



APPENDIX C-3 Estimated yield capabilities of eastern Idaho-western Wyoming habitat types based on site index data and stockability factors.



APPENDIX D

EASTERN IDAHO - WESTERN WYOMING HABITAT TYPE FIELD FORM

(Code Description)

Topography:
1-Ridge
2-Upper Slope
3-Mid Slope
4-Lower Slope
5-Bench or Flat
6-Streambottom

Horizontal Configuration:
1-Convex (Dry)
2-Straight
3-Concave (wet)
4-Undulating

Vegetation Coverage Class:
0-None
T-Rare to 1%
1-1 to 5%
2-5 to 25%
3-25 to 50%
4-50 to 75%
5-75 to 95%
6-95 to 100%

Note: Rate trees (>4") and regen (0-4") separately (e.g. 4/2)

	Abbrev	Common Name	Date		
			Plot No.		
			Loc		
			T.R.S.		
			Elev		
			Aspect		
			Slope	%	%	%
			Topog		
			Config		
TREES					
1. Abies lasiocarpa	AF	Subalpine Fir	/	/	/
2. Picea engelmannii	ES	Engelmann Spruce	/	/	/
3. Picea pungens	BS	Blue Spruce	/	/	/
4. Pinus albicaulis	WBP	Whitebark Pine	/	/	/
5. Pinus contorta	LPP	Lodgepole Pine	/	/	/
6. Pinus flexilis	PF	Limber Pine	/	/	/
7. Pseudotsuga menziesii	DF	Douglas-fir	/	/	/
8. Populus tremuloides	QA	Quaking Aspen	/	/	/
SHRUBS					
1. Acer glabrum	ACGL	Mountain Maple			
2. Alnus sinuata	ALSI	Mountain Alder			
3. Artemisia tridentata	ARTR	Big Sagebrush			
4. Berberis repens (+ aquifolium)	BERE	Oregon Grape			
5. Cercocarpus ledifolius	CELE	Curl-leaf Mountain-mahogany			
6. Juniperus communis	JUCO	Common Juniper			
7. Linnaea borealis	LIBO	Twinflower			
8. Menziesia ferruginea	MEFE	Menziesia			
9. Pachistima myrsinites	PAMY	Pachistima			
10. Physocarpus malvaceus	PHMA	Ninebark			
11. Prunus virginiana	PRVI	Chokecherry			
12. Purshia tridentata	PUTR	Bitterbrush			
13. Ribes cereum	RICE	Squaw Current			
14. Ribes montigenum	RIMO	Mountain Gooseberry			
15. Spiraea betulifolia	SPBE	White Spiraea			
16. Symphoricarpos albus	SYAL	Common Snowberry			
17. Symphoricarpos oreophilus	SYOR	Mountain Snowberry			
18. Vaccinium caespitosum	VACA	Dwarf Huckleberry			
19. Vaccinium globulare (+ membranaceum)	VAGL	Tall Huckleberry			
20. Vaccinium scoparium (+ myrtillus)	VASC	Grouse Whortleberry			
GRAMINOIDS					
1. Agropyron spicatum	AGSP	Bluebeunch Wheatgrass			
2. Calamagrostis rubescens	CARU	Pinegrass			
3. Calamagrostis canadensis	CACA	Bluejoint			
4. Carex disperma	CADI	Soft-leaved Sedge			
5. Carex geyeri	CAGE	Elksedge			
6. Carex rossii	CARO	Ross Sedge			
7. Festuca idahoensis	FEID	Idaho Fescue			
8. Hesperochloa kingii	HEKI	Spike Fescue			
9. Luzula hitchcockii	LUHI	Smooth Woodrush			
FORBS					
1. Actaea rubra	ACRU	Baneberry			
2. Aconitum columbianum	ACCO	Monkshood			
3. Arnica cordifolia	ARCO	Heartleaf Arnica			
4. Arnica latifolia	ARLA	Mountain Arnica			
5. Astragalus miser	ASMI	Weedy Milkvetch			
6. Galium triflorum	GATR	Sweetscented Bedstraw			
7. Osmorhiza chilensis (+ depauperata)	OSCH	Mountain Sweet-root			
8. Pedicularis racemosa	PERA	Pedicularis			
9. Senecio triangularis	SETR	Arrowleaf Groundsel			
10. Streptopus amplexifolius	STAM	Twisted Stalk			
11. Thalictrum occidentale	THOC	Western Meadowrue			
12. Xerophyllum tenax	XETE	Beargrass			
		HABITAT TYPE			
		PHASE			